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OLD ORCHARD BEACH SEWERAGE.

PORTLAND, Me., March 12.—Old Orchard is preparing to construct a system of sewerage that will prevent the introduction of any zymotic diseases. Heretofore hardly any precautions have been taken to prevent the spread of morbific matter, the sandy soil being looked to to absorb all refuse from the hotels and cottages. That the soil has done its duty no one will deny, for no contagious disease has ever made its appearance at the Beach, no matter how many people have been there, or how hot the vacation season has been. This condition of things cannot be tolerated much longer, nuisances have already made their appearance, and it will be but a question of time before they will be followed by some epidemic. The proposed system of sewerage is looked to to remove this danger, and as soon as spring opens the work will probably be begun. Several surveys and plans have been made this winter by Mr. E. C. Jordan of this city, which were submitted to the people of Old Orchard at their town meeting. A committee was thereupon appointed to take the matter into consideration and to call a special town meeting when they shall have reached a decision regarding the plans of the civil engineer. At a recent interview with Mr. Staples, Chairman of the committee, the *Journal's* correspondent was informed that a town meeting will probably be called next week, and $10,000 raised for sewerage purposes. It is now contemplated building a main sewer about a mile long, starting from the electric light station and running easterly along the beach toward the Scarboro' River, and with which all the hotels and boarding houses can easily connect themselves. The land along this route has a gentle declination, and if catch basins are employed to hold all solid matters a steady flow can be maintained. Arrangements will also be perfected for flushing the sewer when desired, or else a small stream that now flows across the beach west of the railroad station will be turned into the sewer, and the flow of sewage thus maintained.

Just how the sewage shall be finally disposed of has not yet been decided upon. Mr. Jordan proposed that it should be run into a series of tanks, thoroughly disinfected, and the remaining solid matters removed, the sewage then poured into the sea at a distance of 200 or 300 feet from the shore. The point at which this would be done is far removed from the bathing grounds, and no traces of the matter would be apparent to frequenters of the beach. From the mouth of the Saco River a gentle ocean current sets toward the Scarboro' River, and where the waters of the ocean and the latter river unite an eddy is formed that would carry the sewerage deposits far enough seaward to prevent their return. The system seems feasible, if a steady flow can be maintained in the main sewer, and this can doubtless be accomplished in the manner suggested above.

Old Orchard also wants a system of waterworks. The water at present used is either pumped from driven wells or taken from springs that have their origin in the hilly region back of the beach. When the Biddeford and Saco Water Power Company was incorporated, authority was given it to extend its service to Old Orchard, but nothing has yet been done in this respect. There is a system of springs about three miles from the beach at an elevation of over one hundred feet that many think could be made to supply all the water required by the people of Old Orchard, and it may be that an attempt will be made to utilize them. No movement in this direction, however, will be attempted this year, as at the present time sufficient water can be procured for fire and domestic purposes with the appliances now in use.—*Cor. Boston Journal.*

Sewerage in Geneva, N. Y.

And Important Question for the Consideration of the People.

We publish a synopsis of the report of the committee on sewerage, as the public mind should be fully informed upon the subject before any call is made for further action in reference to it. It could be wished that this report, and the report of the engineer, Mr. Croes, might be published together in a more permanent form. They treat of a matter of too much importance to the village to be dismissed with a single cursory reading and without careful consideration.

As Mr. Croes was invited to furnish a plan that should cover the possible future needs of the village, he has of course included districts which have no immediate occasion for public sewerage thereby largely increasing his estimates of cost. A reference to the map, which should if possible be published with the report, will show this more clearly.

The committee admit at the outset that any such expenditure would be impracticable.

Three districts, however, are designated as requiring immediate attention.

The first, from Main street to the Lake, between Hamilton and Lewis Sts. The Second, between Main and Pulteney and Hamilton and Lewis Streets, and the third, between Hamilton St. and Mile Point.

Mr. Croes deprecates the use of natural water channels for the conveyance of sewage, as do sanitary experts generally; and Doctor Moore of the State Board of Health in his address at the Franklin House a year or two since, was very emphatic upon this point.

The "separate-service system" as it is called, and which is recommended in this report, seems to have superseded the old methods. But the committee assume that as the Cemetery Creek Sewer—however inadequate or objectionable—has been so recently constructed, at large cost, no other provision for Disticts No. 1 and No. 2 would probably be entertained, until its efficiency has been more fully tested.

In recommending that a beginning should be made in District No. 3, the committee were governed by the following considerations:

That this district has no public sewerage whatever, and can not be safely left longer without it.

That having an independent outlet it can be treated separately better than any other land; that a pipe can be laid through Pulteny street to Mile Point, taking the present sewage of this district flowing in that direction, at a very moderate cost.

Mr. Croes approves of this suggestion, and his estimates for the work, exclusive of irrigation, is about $5,800.

If that method of disposal is adopted the preparation of the land would involve a farther cost of $3,000.

Apprehension has been expressed that in attempting to avoid one nuisance by this plan, a more serious nuisance might be created.

Upon this point Mr. Croes says: "It is found that the soil takes up all the impurities, grass grows luxuriantly over the irrigated area, and no nuisance or offense of any kind can follow the adoption of this system of disposal."

Mr. Croes refers to the successful application of this system in Maine, Massachusetts, and Pennsylvania, by Mr. George E. Waring and other engineers.

It will be noticed that the east side of Main St. would not be provided for by this sewer.

The Committee thought, as it had the advantage of draining to the lake, it could be left for the present at least, though it may be hoped, if the irrigation plan at Mile Point is adopted, a pipe would ultimately be laid under or along

THE Naugatuck R. R. bridge over Beaver Brook, between Ansonia and Derby, Conn., was destroyed by a flood on March 26.

Streets, Drainage, Sewerage, Etc.

CONTRACTS for Cedar Block paving in Toronto, Can., to the amount of $110,000 were let last week.

MANSFIELD, O., may borrow $39,000 for sewerage purposes.

THE Salem, Mass., sewer if built will cost over $60,000. Length 10,000 feet.

THE Atlantic City, N. J. Drainage Company have resumed work and expect to complete their system and have it in successful operation by the 1st of July.

WOODEN pavement is in marked disfavor in Berlin. What is known as Vienna head pavement is taking its place. The wooden article laid down in the neighborhood of the Crown Prince's palace has failed after a short year of trial.

A SPECIAL borough meeting, held last week at Stamford, Conn., for the purpose of voting upon a system of sewerage which had been recommended by the Warden and Burgesses, and on the question of bonding the borough for $100,000, was the most exciting ever held there. The Town Hall was packed. Finally a motion for indefinite postponement was carried by a vote of 144 to 79, not half of those present voting. The result was a great disappointment to some leading citizens who want the own sewered

COUNCILS Highway Committee of Phila. met on the 24th in the office of the Chief Commissioner in the new Public Buildings, and opened and scheduled bids for various contracts and supplies. The lowest bidder for the building of an intercepting sewer in Fairmount Park was John J. Kennedy, at $9.49 per foot; for sewer at Rock Tunnel, J. J. Kennedy, $32.91 per foot; for sewer from Rock Tunnel Northwest, N. B. M. Conklin, $12.47 per foot.

The bids for repairing South Street Bridge were: James Armstrong, $105,000; Childs & Conklin, $81,920; Clark, Reeves & Co., $107,000; for repairing Chestnut Street Bridge, R. J. & R. B. Malone, $58,000; Anderson & Barr, Little Rock, Ark., $53,000. The bidder for coal for the department was J. S. Cross, $6.75 per ton. The lowest bidders for grading were N. B. M. Conklin and Daniel Mooney, each 23 cents per yard; for furnishing curbstones, Daniel Mooney, 65 cents per foot; for new granite curbing, B. McNichol, $1.40 per foot; for laying brick payments, N. B. M. Conklin, 52 cents per yard. The name of H. J. Becker was removed from the contractors' blacklist.

THE contract for constructing a part of the Gillis street public sewer was let yesterday by the city engineer in the presence of Aldermen Patterson, Sweet, and Regan, to H. B. Alexander at $13,274.50. The other bidders were William H. Faulkner, $15,835.50, and John Shaw, $14,270. The contract calls for 775 lineal feet of four foot two inch brick sewer; 330 lineal feet of four foot six inch brick sewer, eight catch basins, seven man-holes, twenty-five cubic yards of concrete, 1,000 feet of lumber, 100 feet four inch agricultural sewer pipe. The contract was let subject to additional appropriations. The sum of $6,000 was appropriated at a recent meeting of the council, and the work will be proceeded with to the extent of $6,000, and an additional appropriation then obtained.—Kanas City, *Times*, 23.

THE question of sewerage is exciting active discussion in Kingston, N. Y.

Gas and Electricity.

RICHMOND, VA., has a Board of Public Interests, which has just reported upon an investigation of the Gas Department; among other items they give the following as the cost of gas in that city, as reported by the department:

Cost of distribution, manufacture and extension of mains for eleven months, ending December 31, 1883, $1.03 9-10 per 1,000 cubic feet.

Cost of gas in the holder in November, 1883, 59c. per 1,000 cubic feet.

Cost of gas in holder in December, 1883, 55 95-100c. per 1,000 cubic feet.

Cost of gas at the burner in November, 1883, 70c. per 1,000 cubic feet.

Cost of gas at the burner in December, 1883, 65 94-100 per 1,000 cubic feet.

Cost of gas in the holder for eleven months ending December 31, 1883, 66c. per 1,000 cubic feet.

Cost of gas at the burner for eleven months, ending December 31, 1883, 93c. per 1,000 cubic feet.

The Board state that in the above statement the interest on the plant is omitted; adding the interest on $1,150,000, the cost of the works, to the above, with 107,009,820 cubic feet made, would result in $1.63 per 1,000 cubic feet as a more correct figure of total cost.

THE Brush Electric Light Company have been making experiments with electric motors at Cleveland, and a railroad has been built for the purpose of testing the motors for tram cars.

AN ordinance granting a franchise to the Western Edison Electric Light Company to lay a system of underground electric conductors in the village of Hyde Park, Ill., was engrossed.

EDISON, the inventor indulges in the following prediction: As to the changes which will be effected by electricity within fifty years in the city of New York, I would say that I believe electricity will propel the cars of the street and elevated railroads, light the city within and without its buildings, furnish power for all purposes, work telephones and burglar alarms, deliver the opera, convey parcels, detect and signal fires, operate fire engines and possibly displace animal locomotion for vehicles.

THE high cost of lighting the city by electricity has furnished the Aldermanic Committee on Lamps, who have been investigating the subjects with an incentive to inaugurate a better and more general lighting by gas. It is said that when the electric light companies' contracts expire, in April next, the number of electric lights will be reduced perhaps one-half, and the number of large gas-lights will be increased. The electric light companies manifest little inclination to reduce their rates, while some of the gas companies are willing to make concessions. The committee will seek to give the city better light at a reduced cost.—*Boston Commonwealth*, March 15.

THE Philadelphia Councils Committee on Water-works opened the following bids for Electric Light Plant, and other supplies. For Electric Lighting Plant for Spring Garden Station—U. S. Electric Lighting Company of Pennsylvania, one plant, complete, running any number of incandescent light from 1 to 200, for $4,460.50, or two plants complete, one running 1 to 110 lights, and the other 1 to 65 lights both for $6,218.90; The Edison Company for isolated lighting, one plant, complete, and 175 lamps of 16 candle power to last 600 hours, for $5,636, or two separate plants, with 110 and 65 lamps, respectively, for $6,176, or instead thereof, the said lamps to be equally divided between the engines and appliances at the same price, or will furnish 1 engine and 2 equal dynamos with 175 lamps, for $5,935.

But one proposal was received for the two steel boilers for the Spring Garden Station that of the Edgemoor Iron Company at $13,025.

SIEGMUND T. MEYER, Asher T. Meyer, Charles C. Peck, William H. Chapman, and Philip L. Meyer are the corporators of the Chapman Electric Motor Company, whose certificate of incorporation was filed in the County Clerk's office last week. The new company is to acquire legal title to certain letter patents for improvements in electric motors, electric generators, electro-magnetic apparatus, commutators; to build such apparatus and apply them to all the uses to which they are suited, or to license others so to apply them. The capital stock is fixed at $500,000. The company proposes to manufacture an electric motor for which patents have been obtained by William H. Chapman. It differs from other motors in that the armatures are brought into a close contact with the magnet. The motors are to be light; one that will draw a car will weigh only 150 pounds. "The cross-town routes laid out by the Rapid Transit Commissioners would be especially adapted to the use of such motors" said an interested incorporator recently. A factory will probably be built in East Thirteenth-street.

Articles of incorporation of the Globe Electric and Underground Conduit Company have also been filed. The company is to manufacture, buy, and sell electrical conductors and to construct underground conduits for electrical purposes. Its capital stock is $2,000,000, divided into 200,000 shares of $10, each. Its incorporators are J. Clayton Erb and William D. Neilson, of Philadelphia, and J. Morris Welch, George R. Cinnamond, and Charles Reynolds Logan, of this city.—*N. Y. Times*,

IRON, METAL AND COAL MARKETS.

PHILADELPHIA, Mar. 27, 1884.

Transactions in Iron and Steel have not been of large proportions this week, and prices show no improvement, but inquiry is more active, and consumers are providing for current requirements with a little more freedom; considerable sales of pig iron could be made, both of Northern and Southern makes, if concessions could be had; but prices are now down as low as they will go, and Southern makers especially, are holding very steadily to asking prices. No. 1 Foundry is quoted at $20@$21; supply is light, but demand is of moderate proportions; No. 2 is very dull at about $19; Gray Forge, $18, delivered for average makes of Northern and Southern Forge. Steel rails are quiet, and prices are weak; sales of over 75,000 tons have been made within the past 10 days in Eastern and Western mills, and there are inquiries in hand for about half that amount, which will probably develop into business within a week or two. $34 is the usual mill price paid, but some sales are said to have been made at $33.50, although this is denied by makers. As soon as mills run a little short of orders, $33@$33.50 will probably be accepted for the large orders which are waiting to be placed. Iron for engineering requirements has sold in small lots during the week, but the large business which has been in sight for some weeks, is still withheld; Angles have sold at $2.20; Beams and Channels, $3.50, subject to 12½ per cent. discount. Merchant Iron is in rather better request in small lots, but prices are weak, and no large orders have been placed. Old Rails would sell freely at $21.50@$22, but are held $1@50c. above. Muck Bars are quoted at $32@$33, but sell as low down as $31 at mill, for ordinary makes. There is a slightly better tone in the Iron trade, but spring demand is still kept back, and business is wholly of a retail character.

PITTSBURGH, Mar. 27, 1884.

Inside quotations for Iron and Steel in Western Pennsylvania are as follows: $35@$36 at mill for Steel rails, $23.50@$24 for Old rails, $32 for Muck Bars, $20@$21 for Bessemer Pig, $18@$20 for Foundry Irons, $17@$18 for Mill Iron, $2.50 for Nails, $20@$21 for Wrought Scrap, $1.70@$1.90 for Bar Iron. Business is still far below the expectations of sanguine manufacturers, but shows an improvement over previous weeks. Only small proportion of the mills are working full; Singer Nimick & Co. have enough orders ahead to keep them running steadily; Carnegies Structural Iron Mill is full of work, having enough to last for several weeks. The Forging Department of Painter & Son Mill is closed down; 268 men are thrown out of employment. The Third Pool miners continue working at the reduction, and the result has been that reductions have taken place in the other Pools. All the miners are not at work, but it is probable that the reduction will in all cases be accepted.

CHICAGO, Mar. 27, 1884.

The production of Bar Iron for the past few months has been extremely light, and stocks have run down to almost nothing, but prices have not improved, nor has demand increased as was expected. Very few mills are running double turn and though small lots of Bars are moving with some activity, the aggregate of business is small, and prices are without improvement. Common Iron is quoted at $1.90, and Refined at $2, with concessions obtainable on good orders. The demand for Structural and Tank Iron has been more active at unchanged prices. Merchant Steel is less active than it has been for a week or two past, although an improvement at this time was confidently expected. Steel Rails are dull at $36@$37; makers are unwilling to make the desired concessions, and railway builders are unwilling to order heavily at present asking prices. Southern Pig Irons are still in favor. Foreign Irons are scarce, but in less demand than would be expected, on account of the increasing substitution of the domestic production. The movement in Heavy Hardware and Railway Supplies has been better; prices for Barbed Wire are stiffer and demand is active; Builders Hardware, and Farming and Gardening Implements are in good request, and business is brisk. Tubes, Pipes and Fittings are dull and quiet;

COAL.

PHILADELPHIA, Mar. 27, 1884.

The Anthracite Coal trade is very dull at present, but now that Harbor prices have been announced, it is thought that a more active demand will be developed; City and Line prices will be announced on Friday of this week. The policy of the Anthracite Companies has not been announced as yet; it is probable, however, that a further restriction of production will be agreed upon, as even half time production is too heavy for the present market requirements, and full time output will be almost certain to result in a break in prices; but, on the other hand, the companies will lose heavily if they restrict their production any further; there are strong arguments in favor of both plans, and it is impossible to say which evil will be considered the less. Large contracts for Bituminous Coal have been already placed in Eastern and Lake Markets, and negotiations are now in progress, which will probably lead to the placing of others; inquiry from the South is becoming more active, and heavy shipments in that direction will soon be made. Western markets will take enormous supplies of Coal this season, but orders have not yet been placed, to any great extent. Port Richmond stocks are but little under 100,000 tons. The line trade is quite active, and will be more so after the announcement of prices. Anthracite reduction for last week reported, 459,000 tons. The Clearfield region is producing about 60,000 tons per week.

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Good Chinese ink improves with age, and should not be used for a few years after it is made. It is not easy to keep it as it must be protected from moisture. Some persons, in rubbing it up, make circular movements that soon ruin it. It is better to rub it in straight lines back and forth with the least possible pressure.

OLD ORCHARD BEACH SEWERAGE.

Portland, Me., March 12.—Old Orchard is preparing to construct a system of sewerage that will prevent the introduction of any zymotic diseases. Heretofore hardly any precautions have been taken to prevent the spread of morbific matter, the sandy soil being looked to to absorb all refuse from the hotels and cottages. That the soil has done its duty no one will deny, for no contagious disease has ever made its appearance at the Beach, no matter how many people have been there, or how hot the vacation season has been. This condition of things cannot be tolerated much longer, nuisances have already made their appearance, and it will be but a question of time before they will be followed by some epidemic. The proposed system of sewerage is looked to to remove this danger, and as soon as spring opens the work will probably be begun. Several surveys and plans have been made this winter by Mr. E. C. Jordan, of this city, which were submitted to the people of Old Orchard at their town meeting. A committee was thereupon appointed to take the matter into consideration and to call a special town meeting when they shall have reached a decision regarding the plans of the civil engineer. At a recent interview with Mr. Staples, Chairman of the committee, the *Journal's* correspondent was informed that a town meeting will probably be called next week, and $10,000 raised for sewerage purposes. It is now contemplated building a main sewer about a mile long, starting from the electric light station and running easterly along the beach toward the Scarboro' River, and with which all the hotels and boarding houses can easily connect themselves. The land along this route has a gentle declination, and if catch basins are employed to hold all solid matters a steady flow can be maintained. Arrangements will also be perfected for flushing the sewer when desired, or else a small stream that now flows across the beach west of the railroad station will be turned into the sewer, and the flow of sewage thus maintained.

Just how the sewage shall be finally disposed of has not yet been decided upon. Mr. Jordan proposed that it should be run into a series of tanks, thoroughly disinfected, and the remaining solid matters removed, the sewage then poured into the sea at a distance of 200 or 300 feet from the shore. The point at which this would be done is far removed from the bathing grounds, and no traces of the matter would be apparent to frequenters of the beach. From the mouth of the Saco River a gentle ocean current sets toward the Scarboro' River, and where the waters of the ocean and the latter river unite an eddy is formed that would carry the sewerage deposits far enough seaward to prevent their return. The system seems feasible, if a steady flow can be maintained in the main sewer, and this can doubtless be accomplished in the manner suggested above.

Old Orchard also wants a system of waterworks. The water at present used is either pumped from driven wells or taken from springs that have their origin in the hilly region back of the beach. When the Biddeford and Saco Water Power Company was incorporated, authority was given it to extend its service to Old Orchard, but nothing has yet been done in this respect. There is a system of springs about three miles from the beach at an elevation of over one hundred feet that many think could be made to supply all the water required by the people of Old Orchard, and it may be that an attempt will be made to utilize them. No movement in this direction, however, will be attempted this year, as at the present time sufficient water can be procured for fire and domestic purposes with the appliances now in use.—*Cor. Boston Journal.*

Sewerage in Geneva, N. Y.

And Important Question for the Consideration of the People.

We publish a synopsis of the report of the committee on sewerage, as the public mind should be fully informed upon the subject before any call is made for further action in reference to it. It could be wished that this report, and the report of the engineer, Mr. Croes, might be published together in a more permanent form. They treat of a matter of too much importance to the village to be dismissed with a single cursory reading and without careful consideration.

As Mr. Croes was invited to furnish a plan that should cover the possible future needs of the village, he has of course included districts which have no immediate occasion for public sewerage thereby largely increasing his estimates of cost. A reference to the map, which should if possible be published with the report, will show this more clearly.

The committee admit at the outset that any such expenditure would be impracticable.

Three districts, however, are designated as requiring immediate attention.

The first, from Main street to the Lake, between Hamilton and Lewis Sts. The Second, between Main and Pulteney and Hamilton and Lewis Streets, and the third, between Hamilton St. and Mile Point.

Mr. Croes deprecates the use of natural water channels for the conveyance of sewage, as do sanitary experts generally; and Doctor Moore of the State Board of Health in his address at the Franklin House a year or two since, was very emphatic upon this point.

The "separate-service system" as it is called, and which is recommended in this report, seems to have superseded the old methods. But the committee assume that as the Cemetery Creek Sewer—however inadequate or objectionable—has been so recently constructed, at large cost, no other provision for Districts No. 1 and No. 2 would probably be entertained, until its efficiency has been more fully tested.

In recommending that a beginning should be made in District No. 3, the committee were governed by the following considerations:

That this district has no public sewerage whatever, and can not be safely left longer without it.

That having an independent outlet it can be treated separately better than any other land; that a pipe can be laid through Pulteny street to Mile Point, taking the present sewage of this district flowing in that direction, at a very moderate cost.

Mr. Croes approves of this suggestion, and his estimates for the work, exclusive of irrigation, is about $5,800.

If that method of disposal is adopted the preparation of the land would involve a farther cost of $3,000.

Apprehension has been expressed that in attempting to avoid one nuisance by this plan, a more serious nuisance might be created.

Upon this point Mr. Croes says: "It is found that the soil takes up all the impurities, grass grows luxuriantly over the irrigated area, and no nuisance or offense of any kind can follow the adoption of this system of disposal."

Mr. Croes refers to the successful application of this system in Maine, Massachusetts, and Pennsylvania, by Mr. George E. Waring and other engineers.

It will be noticed that the east side of Main St. would not be provided for by this sewer.

The Committee thought, as it had the advantage of draining to the lake, it could be left for the present at least, though it may be hoped, if the irrigation plan at Mile Point is adopted, a pipe would ultimately be laid under or along

the bank, to connect with it, that the entire sewage of this district might be kept out of the lake.

Automatic flush tanks are recommended in the report for cleansing the sewers and as Mr. Croes estimates that 5,000 gallons a day would be ample for the 10 districts, there would seem to be no occasion for apprehension on the score of water supply.

If the Committee succeed only in enlisting public interest in this important question, they will feel that their labor has not been altogether in vain.

LATE LEGAL DECISIONS.

The following is an abstract of some of the more important decisions recently rendered in the higher courts:

CONTRACT RESCINDED—DAMAGES—PROFITS.

One R. entered into a contract with H, a Major of engineers in the United States army to make certain improvements in the harbor of New Orleans, but the contract was annulled by the engineer officer, and B. one of the sureties of R. undertook the performance of the contract. He expended largely for the requisite machinery, material, and labor, and on the work being stopped by the officers, as the plan was a failure, after the sale of the materials left and the plant remaining, his outlay was $33,192.90. Had the work been carried through, B. would have been entitled to $52,000, of which $8,807.10 would have been profits, and he sued in the Court of Claims for $42,000, which was made up of this profit, $8,807.10 and the outlay of $33,192.90. There were no profits showed on the trial, and judgment was given for $33,192.90, only. From this judgment the United States appealed on the ground that by making a claim for profits the claimant asserts the existence of the contract as opposed to its rescission, and that in such case the rate of damages is the difference between the cost of doing the work and what the claimant was to receive for it, making reasonable deduction for the less time engaged, and for release from the case, trouble, risk, and responsibility attending a full execution of the contract; that on such a claim the claimant must show that profits would have been, and as the Court of Claims had found that it does not appear from the evidence whether or not any profits would have been made, or that loss would have been incurred therefor, the claimant was not entitled to judgment for any amount whatever. In this case, United States vs. Behen, the Supreme Court of the United States disregarded this unconscionable defense, and affirmed the judgment for $33,192.90. Mr. Justice Bradley, in the opinion, said: "Unless there is some artificial rule of law which has taken the place of natural justice in relation to the measure of damages, it would seem to be quite clear that the claimant ought at least to have been made whole for his losses and expenditures. The primary measure of damages is the amount of the party's loss; and this loss may consist of two heads or classes of damage—actual outlay and anticipated profits. But failure to prove profits will not prevent the party from recovering his losses for actual outlay and expenditure. If he goes also for profits, then the rule applies as laid down by the Government, and his profits will be measured by the difference between the cost of doing the work and what he was to receive for it. The claimant was not bound to go for profits, even though he counted for them in his petition. He might stop upon a showing of losses. The two heads of damages are distinct, though closely related. When profits are sought a recovery for outlay is included and something more. That something is the profits. If the outlay equals or exceeds the amount to be received of course there can be no profits."

Persons contracting with a municipal corporation must at their peril inquire into the power of the corporation or its officers to make the contract. So held by the Kentucky Court of Appeals in the recently decided case of The Trustees of the Town of Bellevue vs. Hahn et al., in which the appellees contracted to improve certain streets of the town of Bellevue, agreeing to look alone to the abutting property-holders for their pay, in no event to look to the town. The trustees of the town having no power under the charter to cause the streets to be improved at the cost of the owners of adjacent property, the court decided that the contract was void so far as it attempted to make the lot-owners responsible, and that there was no implied promise by the city to pay because the lot-owners were never bound.—*Bradstreets.*

In a suit for damages sustained in consequence of the unsafe condition of a bridge, it is not essential that the public officers having charge thereof should be proven to have had actual notice of the defect, but if such defect has existed for such a length of time that they ought to have taken notice of it the law will charge them with notice. So held by the Supreme Court of Indiana in the case of The Commissioners of Porter County vs. Dombke, decided March 8. The court added that the question, what is such a length of time as will charge public officers with notice of a defect in a bridge or highway, must in a great measure depend on the circumstances of each particular case, and must in most cases be a question of fact to be submitted, under proper instruction, to the jury.—*Bradstreets.*

THE RAINFALL THIS YEAR.

Present appearances promise an interval of agreeable weather, which, after the experience of the last three months, will be exceedingly welcome. Casting a retrospective eye upon the months of January, February and what has gone by of March, there is nothing visible save a pitiless succession of snow storms, wind storms, rain storms, drizzle and fog, with hardly an interval of bright days. A *Tribune* reporter recently called upon Prof. Daniel Draper, of the Observatory in Central Park, and asked him to what abnormal figures the rainfall had reached this year. "Ah!" he said, "the weather has been so execrable that your ideas of the rainfall have been colored. The rainfall for January was in inches 5 22-100. In January, 1883, it was 2 61-100. The average of January from 1836 to 1882 is only 3 34-100. But 1841 had a January rainfall of 5 30-100; 1850, of 5 57-100; 1859, of 5 70-100; 1862 of 5 60-100; 1863 5 45-100; 1875 of 5 34-100; and 1882 of 5 8-100. Obviously last January was abnormal. Take February for this year—4 92-100 inches. In 1883 the February rainfall was 4 21-100 inches. The average for the last forty-seven years is 3 34-100. In 1847 the fall was 5 74-100; in 1853 it was 4 98-100; in 1855, 5 12-100; in in 1859, 5 59-100; in 1866, 10 9-100—that was a big rainfall in reality. In 1867, it was 5 53-100; in 1869, 6 87-100; in 1876, 4 81-100, and 1881, 4 93-100. This shows that the rainfall of February of this year, though above the average, cannot be considered as big. The rainfall of the twenty-three days of March is 3 77-100 inches. It is unnecessary to calculate further, because two hours of heavy rain might make it high among the average, whereas at present it seems quite light. March generally is a heavy rain month. In 1837, it was 8 20-100 inches; in 1847 it was 8 48-100; in 1849, 4 87-100; in 1859, 8 21-100; in 1863, 5 77-100; in 1865, 8 32-100; in 1871, 5 54-100; in 1876, 8 79-100; in 1877, 5 56-100; in 1881, 5 81-100; and yet in spite of these the average for March for 47 years is little above January or February—only 3 82-100 inches. The average for the present three months is 13 91-100, while last year it was only 8 31-100, and for the 47 years it is only 10 50-100. This shows, as I said, that it is above the average, but it is abnormal. February, 1866, was abnormal; August, 1882, was abnormal. That was 16 85-100.

These averages, however, must not be taken for more than they are worth. The observations taken at the Paris observatory for 190 years showed conclusively that there was a cycle in rainfalls which in that region was sixty years. During half of that period there was a decreasing average, and during the other half an increasing average. Local influences are such great factors in the matter of rainfalls that we may find our cycle different from that of Paris. My observations show that our decreasing average began in 1868, and this would, if our cycle was of sixty years, come to a conclusion in 1898. But the size of our cycle has yet to be determined. It may be longer or it may be shorter. In consequence of reasoning from insufficient data many of the writers upon the Adirondack question have assumed that there is a steadily decreasing rainfall, and have attributed it to the felling of timber. The fact is that we are now in the middle of our decreasing series. Should ever a long series of observations establish the fact conclusively that there was a true and constant decrease of rainfall it would be all over the world, and would be due to decreased power in the sun, This would be shown in diminished evaporation, and this in fewer rain-clouds, giving a smaller rainfall."—*N. Y. Tribune*, March 25th.

"Dredgers and Dredging on the Tees."*

BY JOHN FOWLER. M. INST. C. E.

Dredging operations in the Tees are of comparatively recent date. In 1824 a small dredger was hired and employed for some months upon a hard shoal at the east end of the second cut, immediately below Stockton. It was, however, a very inefficient machine, the time spent over repairs being more than that occupied in dredging. Exclusive of the Priestman grab, the Commissioners have now four dredgers, No. 2. having the ladders outside, and the other three working in separate wells. Their principal dimensions are as under:—

	No. 2.	No. 3	No. 4.	No. 5
Length	Ft. Ins. 112 0	Ft. Ins. 125 0	Ft. Ins. 135 0	Ft. Ins. 140 0
Breadth	29 0	34 0	34 6	34 6
Depth	9 0	9 6	10 6	10 6
Cylinder	In. In. 33×36	In. In. 35×40	In. In. 35×40	In. In. 35×40
Length of bucket fr.	Feet. 65	Feet. 79	Feet. 76	Feet. 80
Size of buckets	Cu. ft. 9	Cu. Ft. 9	Cu. Ft. 9	Cu. Ft. 9
When built	1866	1871	1878	1884
Original cost	£ 10,134	£ 13,800	£ 17,340	£ 18,100

All are fitted with force pumps to raise water to the shoots, a winch on either end provided with three barrels, each working independently of the other, and fitted with differential wheels, so as to heave-in the mooring chains at either 6 feet or 12 feet per minute. There is a capstan at each end, driven from the engine, for hauling the barges alongside; also a 5-ton derrick-crane for changing buckets and bottom tumblers.

The greatest expense incurred in repairs is for the bucket-chain. Twenty years ago buckets, pins, mouthpieces and links were made of forged or wrought-iron, the principal wearing parts being laid with blister steel. The double links were riveted on to wrought-iron backs, but with the continual jarring in working, the rivets soon became loose, then the holes began to wear. If taken off in time they could be fastened with larger rivets, and so made to serve a little longer, but very soon new backs had to be put on.

*From Excerpt Minutes, Institution of Civil Engineers, March, 1884.

These repairs being all smith-work were very expensive, and renewals had to be effected every four months. Sixteen years ago the Author made trial of cast-steel backs, having the links cast on. Some difficulty was experienced at first in obtaining the castings sound; but by perseverance this difficulty was overcome, and they are now supplied perfectly sound. Cast-steel pins were then tried, next single links, and lastly cast-steel mouthpieces. The mouthpieces are delivered flat from the works, and are guaranteed to bend to the required shape, which, if they do, they will stand the work without breaking.

The buckets are put together at the Commissioners' shops, and have about 9 cubic feet capacity. The eyes of the backs are cast of a size to admit a cast-steel pin, smoothed with an emery wheel, and worked until worn large enough to admit of bushing with as little boring as possible; they are then bored out, and turned bushes fitted in. Pins and bushes wear on the pulling side; the pins are allowed to remain until worn out; but the bushes are taken out and turned; with this they last about four months.

The tumblers are also of cast steel; the lower tumbler is six-sided, the top tumbler four-sided, each cast in one piece; the lower tumbler has cast-iron "noggs" on the middle of each side to keep the buckets in place.

When the Commissioners resolved on procuring a second dredger, it was evident that the greater part of the dredgings would have to be deposited at sea. The question had therefore to be considered how this could best be done. Had the financial position of the Commissioners at the time been such as to enable them to expend a larger sum on dredging plant, steam-hopper barges would have been recommended by the Author; but as a sufficient number of hopper barges, to work one dredge could be got for half the money, and as the towage could be done by hire, it was resolved, under the circumstances, to begin with ordinary barges. Subsequent experience and investigation at different times has not enabled the Author to recommend a departure from the system then adopted.

The barges are built of iron, and at first were designed to carry 200 tons; but afterwards they were enlarged to carry 300 tons. The general dimensions are: extreme length, 89 feet; breadth, 27½ feet; depth, 11 feet. The capacity of the hopper is 5,500 cubic feet, or rather more than 200 cubic yards. There are six doors, three on each side, hinged on the kelson, the size of each door being 8½ feet by 6 feet. Six barges built during 1883 have cost, including all fittings and superintendence, £2,240 each; but at the present time, January 1884, they could be got for £1,800. From six to eight, according to the distance from the discharging ground, are required to keep each dredger at full work.

As already stated, the steam-tugs were at first hired, but the Commissioners have now five of their own, and a sixth building. They also employed two, or sometimes three, on hire; these vary in size from 30 to 50 HP. nominal. The medium between these sizes is economical. The accounts relating to the steam-tugs are kept separate from those belonging to the dredgers account; the work done by the Commissioners' boats is charged to dredging at the same rate as is paid for boats on hire, and is sufficient to cover interest and renewals.

The dredgings are discharged into the sea 3 miles beyond the bar. When working within 7 or 8 miles of the discharging ground, one of the larger boats can keep a dredger supplied with barges. From 8 to 11 miles, two boats are required; these make two journeys to sea, and take two barges each time, or an average of four barges per day when at regular work.

The distance between Stockton bridge and the bar is 12 miles. The dredging operations, however, have as yet only extended over 9½ miles, of which at first two-thirds of the bed of the river was of sand or silt, and one-third clay and stones. The clay was reached at a depth of from 7 to 9 feet below low water over the greater part of the river, except about 2 miles in front of Middlesbro', and in the second cut. The character of the clay varies from soft plastic to very hard and dry; and in all cases boulders are met with; but they are more numerous in the hard ground. Numbers of them are sometimes found together in pockets; their general weight is from 5 cwt. to 1 ton, but they often attain 4 tons, and one boulder was lifted weighing more than 7 tons. A great many of the smaller stones are brought up by the buckets, but the larger once are pushed to the side of the cutting, and are lifted up by divers.

A large quantity of oak trees have also been met with, partially embedded in the clay, but in holes or depressions, and in numbers together. No. 2 dredger, in the autumn of 1883, in four weeks exposed one hundred and thirty-four trees, varying in length from 12 to 60 feet and from 15 inches to 5½ feet in diameter. They nearly all lie with their roots up stream.

The dredger are not worked double shift, but the crews being paid according to the amount of work done, the hours of labor extend generally over all the daylight, and in summer up to sixteen hours per day. A certain quantity, varying according to the character of the material, is considered a week's work, and all above that quantity is paid for *pro rata*, and divided amongst the men according to their rating. In this arrangement the men on the hoppers and also the steamboat men participate. All are thereby interested in pushing on the operations. The tonnage rate includes the time occupied in changing buckets, pins, and links; but should delay arise through break-down, or accident, a corresponding reduction is made in the weekly quantity required.

TEES CONSERVANCY.

I.— Cost of One Dredger Bucket, complete, with Two Links and Four Pins.

	£.	s.	d.	Cwt.	qrs.	lbs.	£.	s.	d.	Per. cent. Less
1 cast-steel bucket back	1	5	0	7	3	23	9	14	0	2½
1 " mouthpiece	1	5	0	1	0	22	1	9	0	"
1 wrought-iron body	0	6	6	1	1	1	0	8	1	"
1 rolled-steel bottom	0	7	0	0	1	16	0	2	11	"
62 B. B. rivets for do.	0	10	6	0	0	18	0	1	8	
Labor fitting above, and use of tools							1	10	10	
2 cast-steel single links	1	5	0	2	3	0	3	7	1	2½
4 " bushes for do.	1	17	4	0	0	21	0	6	10	"
Labor, boring links, turning and boring bushes and fitting complete							0	3	5	
4 cast-steel pins	2	0	0	0	1	24	0	18	1	2½
4 wrought-iron forelocks							0	0	6	
							18	2	5	

There are forty buckets on a single ladder.

II.—Statement of Cost of Dredging, Labor, and Maintenance, for Three Years ending 31st October, 1883.

	No. 2.	No. 3.	No. 4.
Wages—Dredger crew	2,477 16 0	2,459 9 10	2,738 15 2
" Hoppermen	2,641 16 6	2,457 17 3	2,961 12 5
Coals	903 6 4	886 3 9	981 14 9
Towage	7,153 16 5	6,917 16 9	8,223 16 0
Repairs to dredgers, hoppers and coal craft	2,512 3 0	4,858 1 11	3,489 3 7
Rope, oil, tallow, and sundries	633 18 8	700 3 10	695 15 4
Damages paid	24 19 5	167 13 6	351 1 9
Proportion of diver and crew	202 0 0	131 4 4	131 4 4
Insurance	30 0 0	45 0 0	60 0 0
Total cost	16,699 16 4	18,623 11 2	1,9573 3 4

	Quant'y Dredged. Tons.	Cost per Ton. d.
No. 2 dredger	1,202,485	3'17
No. 3 "	1,553,375	2'34
No. 4 "	2,035,525	2'30

10,000 tons of clay is considered a week's work.

The expense of coaling, and the wages of a superintendent and timekeeper, are included in the wages of a dredger crew.

There are nine men on each dredger, paid as follows, exclusive of overtime:—

	Per Day. s. d.	Per week. £. s. d.
Master	5 10	1 15 0
Engineer	5 10	1 15 0
Fireman	4 0	1 4 0
Foreman	4 0	1 4 0
Four deckmen each	3 6	4 4 0
Cook	3 0	0 18 0
Night watching		0 12 3
Six hoppermen each	4 0	7 4 0
" "	1 10	6 18 0
Proportion of coaling and superintendence		1 18 0
		27 12 3

III.—Statement of Quantity and Quality of Material Dredged by each Dredger, and the Average Distance Towed to Deposit Ground, for Three Years ending 31st October, 1883.

Average Distance Towed.	No. 2. Tonnage.	No. 2. Quality.	No. 3. Tonnage.	No. 3. Quality.	No. 4. Tonnage.	No. 4. Quality.
Miles.						
7	369,640	Sand, clay, and slag.	93,040	Sand, clay, and silt.	835,335	Sand and clay.
8					275,525	Sand and silt.
9	101,080	Sand and silt.	146,780	Sand and silt.	303,475	Sand, clay, and silt.
10	102,985	Sand, clay, and silt.	879,595	Sand, clay, and silt.		
11	102,775	Silt and clay.			492,460	Sand, clay, and stones.
12	294,870	Sand and Silt.	80,880	Clay and stones.	138,730	Sand, clay, and silt.
13	217,480	Clay, stones, and trees.	373,080	Sand and silt.		
14	70,055	Clay.				
	1,202,485		1,553,375		2,035,525	

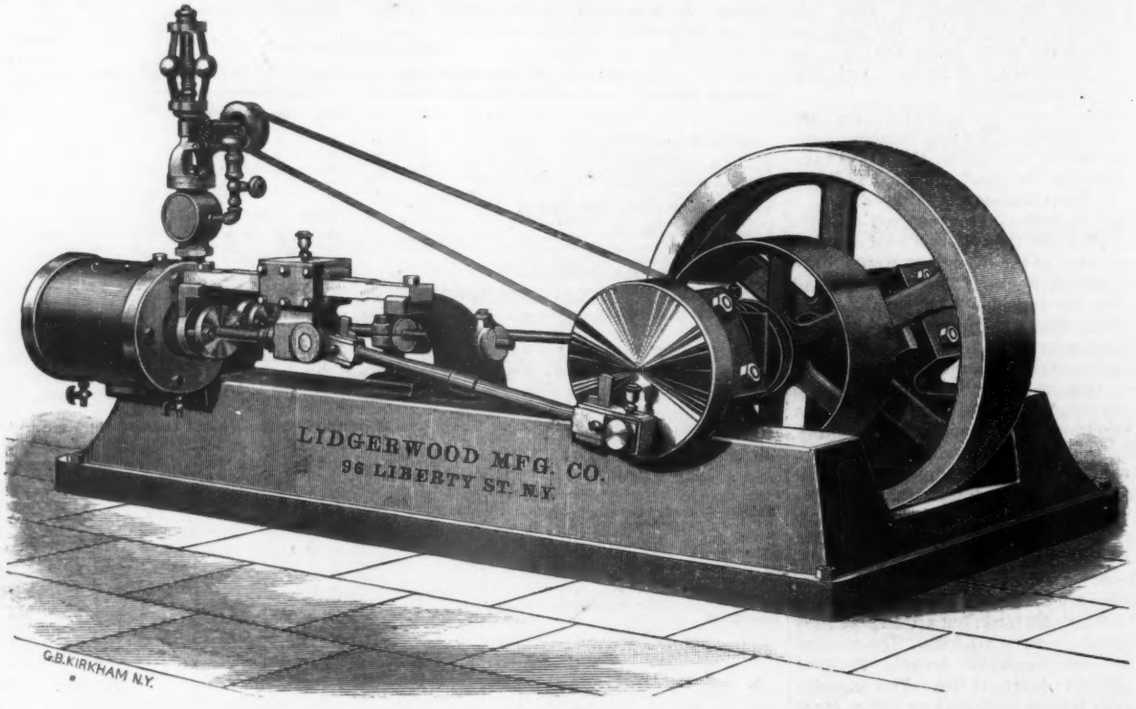
No. 2 dredger was employed about one-half of the time dredging at wharves, where frequently only one ladder could be used.

A New Horizontal Steam-Engine.

The accompanying cut illustrates an improved type of horizontal steam-engine, with plain slide valve, and of small and medium sizes.

The bed-plate is "L" shaped, simple in design and strong, making the engine thoroughly self containing; and insuring with its great depth and broad base, an unusual amount of stiffness, the keeping of all its parts in perfect line, and consequently a smooth and steady running engine.

In design the engine is side-connected with over-hanging cross-head, &c.; the wearing surfaces are extra large and broad, with long connections (3½ times the stroke), reducing the loss of power in friction and the wear and tear in work to a minimum. The gibbs and the boxes of the connecting rods are of composition metal, and the piston rods, valve-stems and all pins are of the best cast-steel; the



crank disk is counterbalanced, and the fly-wheel is turned off inside and out and balanced.

The valve is of the plain "D" type, is clamped to the valve-stem so as to admit of easy adjustment, and has sufficient lap to cut off at ⅞ of the stroke. The main bearings are three times the diameter of the crank shaft, and especial attention has been given to the arrangement of parts so that any point can easily be reached for adjustment.

All parts of this engine are made interchangeable, and can be duplicated at any time and without delay.

The makers, the Lidgerwood Manufacturing Co., of this city, state that this machine is designed to meet a heavy and growing demand for a medium sized engine, first class in all its appointments, but occupying a middle field between the expensive and more or less complicated automatic engines, and the cheap slide-valve engine with which sharp trade competition has flooded the market.

The authorities of the Grand Trunk Railway Company have come to an amicable understanding with their men for the present. The company will not reduce the men's wages for March or April, provided they agree to listen to a compromise afterward. The men have decided to work so long as there is no reduction.

RURAL WATER SUPPLY.

BY CHARLES L. HETT, ASSOC. MEM. INST. C. E.

II.

MAIN PIPES, OR WATER MAINS.

Having already treated of reservoirs for the storage of water; we must now consider the aqueduct or main through which the supply is to be conveyed to the consumer. These are usually constructed of cast or wrought-iron. Wrought-iron or gas pipe is preferred for sizes under 1¼ inches; but cast iron is a better material for the larger diameters. The following table gives the discharge in gallons at two different inclinations. Black wrought-iron pipes may be purchased in quantities at about 65 per cent under the list price, and if galvanized, at 45 per cent. off the list, but fluctuations in the market cause the discounts to vary from time to time:—

Delivery in Gallons, per 24 hours, at an inclination of		Size.
1 in 400, used continuously.	1 in 250, used intermittently.	inches
300	100	½
700	200	¾
2,000	700	1
4,000	1,300	1¼
6,000	2,600	1½
10,000	3,000	1¾
12,000	4,000	2

The first column in the table gives the quantity delivered through pipes of various sizes, with a head of 1 in 400. It is useful in determining the size of main needful for filling cisterns and reservoirs, either by gravity or pumping agency (constantly at work), such as rams, waterwheels, or turbines. The second column, which shows the quantity which will be delivered by the pipe when laid with a fall of 1 in 250, may be used for fixing the size of mains for ordinary water works, when the fall from the reservoir to the domestic tanks is about 1 in 250, or 20 feet per mile. This is a very usual inclination. If the fall is less slightly larger pipes should be used. The quantity is that which would be delivered in the ordinary intermittent manner in which water is drawn off for domestic purposes. If flowing continuously the discharge would be some three or four times greater.

To produce a nice smooth glossy surface on both the outside and inside of cast iron pipes they are coated with a mixture of tar, pitch, and para-naphaline, applied, by making the pipes nearly red hot, and then dipping them into a tank containing the melted liquid. The coating is generally known as Dr. Angus Smith's composition, and it both preserves the pipes from rust, and reduces the friction of flowing water. Pipes fitted with turned and bored joints are more easily put together, but they are more liable to leakage than when run with lead and well caulked.

The mains should be laid about 2 feet deep to be secure from the frost; and in hard ground this depth should be increased to 3 feet. Care should be taken when laying wrought-iron pipes through made ground to protect them thoroughly from contact with old mortar, clinkers, ashes, or cinders. This can best be done by laying them in a trough which is afterwards run in with cement. In natural soil black pipes suffer but little deterioration, and galvanized pipes are almost everlasting. When the water main reaches the house, village, or cottages, it is divided into a series of arterial tubes, the smaller ones being of wrought-iron which convey the water wherever it may be required. In the case of high or medium pressure works ½ inch pipes terminating in ½ screw down taps over the sinks are sufficient for supply of a cottage. Larger houses require additional branches to kitchen boilers, baths, &c; but in the present chapter we do not propose to enter into the details of household sanitation.

PUMPING MACHINERY.

We now propose to consider those cases in which the source of the water supply is situated at a lower level than the house, villages, or other place to which it is to be delivered.

The simplest form of the problem, which presents itself, is that in which the water is to be drawn from a well sunk in the neighborhood of the place of consumption. In this case hand pumping is often resorted to, and a brief description of the commonest forms of hand pumps may not be out of place.

Hand pumps may be divided into two distinct classes, viz., those which lift the water to the top of the working barrel, or thereabouts, and those which force it to a higher level. These two types are distinguished by the generic names of lift, and force pumps, re-

spectively. The ordinary lift pump consists merely of a barrel, constructed of lead or iron, fitted with a clack, or valve at the bottom and a moving bucket carrying another clack.

Pumps of this description are suitable for wells not exceeding 26 feet deep, from the pump spout to the surface of the water, or what amounts to the same thing, 23 feet from the surface of the water, to the ground level. In olden times wooden pump barrels were very common. Although now they are but seldom seen in this country, they are still largely used in America. When the well is shallow and the water requires to be lifted to a height above the surface of the ground, a force pump is employed.

When the water stands more than 23 feet from the surface of the ground a force pump is still employed, but the barrel is placed down in the well within 23 feet of the water, and connected to the handle by well rods. Pumps of this class are known as deep well pumps.

Force pumps are most frequently worked by hand, but horse, wind, or steam power is valuable, if only as an auxiliary, especially if the well is deep.

Some force pumps are simply ordinary lift pumps, strongly constructed, and fitted with a closed top, carrying a stuffing box through which the rod passes to actuate the bucket. Two or more pumps are frequently combined when power other than manual is employed, in order to equalize the force required and to produce a steady flow of water.

A combination of three pumps for using by power are technically known as three-throw pumps. The air vessel is an important adjunct, when the length of rising main is great, more particularly if the pumps work quickly. Their usefulness, however, entirely depends upon whether they are kept properly supplied with air. To ensure this it is advisable to have a sniff valve on one of the pump barrels. It consists of a brass plug with a hole drilled nearly through it, and then a minute drill of the size of a fine needle run through. This small aperture is sometimes closed by a valve opening inwards, but it answers equally well without it. At each stroke of the pump a small quantity of air is drawn in and ultimately finds its way into the air vessel.

The following table gives the proper size of pump to be worked by one man at various lifts, and also the quantity of water which would be raised per minute when worked at the rate of thirty strokes, the bucket moving a distance of ten inches at each stroke. The lift is measured from the level of the water in the well to the point of delivery:—

Lift in ft.	Diameter of pump in inches.	Gallons raised per minute at 30 strokes.	Size of tail pipe in inches.	Size of w. rods.
90	2	3.4	1	⅝
57	2¼	5.3	1¼	⅝
40	3	7.6	1½	⅝
30	3½	10.5	2	⅝
22	4	13.6	2	⅞
14	5	21.2	2½	1
10	6	30.6	3	1

To revert for a moment to antiquarian lore. The old bucket and windlass is too well known in use at the present time to require any description, but the web pump is not so commonly seen. It consists of an endless web of coarse material hung over a barrel fixed in a proper housing above the well, and extending down to and dipping into the water at the bottom. On the barrel being turned by a handle attached to its axle, the web comes up heavily charged with water. A roller is fixed so as to press it against the barrel and squeeze it almost dry. The water falls into a suitable spout which conducts it out of the housing.

WIND POWER PUMPS.

Hand power is too expensive to be used for large supplies of water, and even for houses of only moderate pretensions it is now giving place to horse, steam, wind, or water power.

Horse gear is frequently used as an auxiliary to hand power. It is a wise addition to wind pumps, as a provision against prolonged calm; especially when but limited reservoir capacity is provided. Wind pumps were until recently but little known in this country, except as a means of draining land, brick ponds, &c. They are frequently employed for pumping out ships which suffer from a chronic leak, more particularly those of Scandinavian nationality. In America wind power has been utilized to a much greater extent than with us. In the States wind engines are very commonly used for driving small farmyard machinery as well as for pumping. For these purposes many new types have been introduced.

After a careful examination of the best American and Continental examples, and extensive experience with wind corn mills of our own country, we have adopted the annular sail in our own practice. This form of mill was invented by Mr. Richard Ruffles, of Haverill, Essex, and the first mill of the kind was built for him in 1855. The diameter of the sail in this case is 48 feet. The tower is a lofty one, the centre of the wind shaft being about 63 feet above ground level. The mill is fitted with four pairs of mill stones, and the usual finishing machinery. The sail will drive three pairs of stones, when neighboring mills fitted with four Cubitt's sails, each 33 feet long, will only run two pairs. Although the mill has now been at work for twenty-eight years it has required hardly any repairs, except a set of new whips, which were put up some four years ago.

When wind power is employed sufficent storage should be provided, equal to at least 3 weeks consumption. The larger sizes of wind pumps are usually erected on brick towers, but this is not invariably the case.

THE FLORIDA EVERGLADES.

A correspondent of the *Boston Journal* thus speaks of the drainage work already accomplished in the Florida Everglades, under the direction of Capt. R. E. Rose: "From Sanford, on the St. Johns River, the Florida Central Railroad brought us through 40 miles of incipient towns with winter hotels to Kissimmee on the edge of Lake Tohopekaliga, which is near the upper level of the great swamp region. Imagine a shallow basin from 30 to 50 miles wide and 150 long, sloping slightly to the south and divided by low dams across it into shallow ponds or lakes, slowly oozing and overflowing from one to the other until the whole is lost by evaporation in the Okeechobee Swamp. Canals 40 feet wide and of a depth increasing as the water lowers, have been cut from one lake to another, the Kissimee River channel almost made anew, and the great swamp connected by direct channel with the Calobahaichie River, emptying into the Gulf. A steamboat 130 feet long and 30 feet wide, lying here at the wharf, has come from New Orleans across the Gulf and up the artificial canals. The work of cutting has been done by endless chains armed with buckets, lifting the earth from the bottom and discharging on each side, and working down stream and then back again until the requisite depth is obtained. So that the first boat, all the materials of which were hauled here by ox teams or cut from the surrounding forests, has actually dug its way to the sea. The lake in front of us has already been lowered seven feet, turning from impassible morass into arable land about 150 square miles. I have seen sugar cane growing where two years ago the first dredge boat came to anchor.

An application was made to the Attorney-General in Albany, on Wednesday, for the appointment of a receiver for the Catskill Mountain Railroad, which is alleged to be insolvent. The hearing is put down for April 23.

SELECTED MISCELLANY.

The electric lights on the high masts at Los Angeles, Cal., can be distinctly seen from the Island of San Clemento, eighty miles out at sea.

The report on the sanitary condition of Montreal for 1882 has just been made public. The population is estimated at 144,000; the death rate was equal to 27.1 per 1,000, against 31.8 in the ten preceding years. In these years the lowest rate was 25.9 in 1880, and the highest 37.4 in 1872. The French Canadians constituted more than one-half the population: with them the death rate in 1882 was 32.5, while it was 23.5 among other Roman Catholics, and 18.2 among the Protestants. Of the total deaths among the French Canadians 61.7 per cent. were children. Nearly 24 per cent. of all the deaths were from zymotic or preventable diseases. The municipality is showing much energy in promoting the passage of an adequate health bill.

George Walter, a civil engineer in the employ of T. P. Roberts, of Pittsburg, Pa., relates a curious story. He is a native of Schlatt, Prussia, and was born in 1849. At the school which he attended there were fifteen other pupils—eight girls and seven boys—all of whom were born in the same year. In 1856 one boy and one girl died. As years rolled on the schoolmates separated, some marrying and others remaining single. Recently Mr. Walter came to Pittsburg, and during his sojourn here has discovered twelve of his old schoolmates or forty-niners—six men and six women—nearly all of whom are comfortably settled in various parts of the city. The other two of the original sixteen are still residing in Germany.

On Jan. 1, 1882, the inhabitants of Russia numbered 91,118,514, living in sixty-three provinces and eleven districts. During the year 1881 there were 4,043,-853 births and 2,826,438 deaths registered, the growth of the population being 1,217,425 inhabitants. At this rate the population would rise to a hundred million in 1890, and in sixty to seventy years it would double. At present the population of the empire is ninety-four millions. The growth of population is largest in the southern parts and smallest in the northern, where also the mortality is greatest. It is difficult to say whether this is to be attributed to the climate or the economic conditions of the country. The average of life in Russia is twenty-six years, in Europe, and thirty-one in Asia. This fact is explained by the enormous mortality of young children. It has been ascertained that sixty per cent. of the children die under the age of five years, which means one and a half million of deaths per annum among young children. It has also been proved that more than half the male population die before attaining the age of military service. On an average, a person is born in the Russian empire every eight seconds, and a death occurs every eleven seconds. In St. Petersburg a human being passes away every fifteen minutes.

Why the Chinese Oppose Railways.—Foreigners in China make a great outcry about the stupidity of the Chinese in holding out against railroads. Chinese do hold out against railroads, and they are quite right in doing so. They feel that to introduce railways at present would be to flood the country with foreign engineers, contractors, managers, machine mechanics, engine-drivers, &c., and once there the Chinamen fear that they would never leave, but get a hold on the country, and that China would become a second India and pass under the foreign rule. Rather than have the foreigner they go without the railway and bide their time. Railways and the rest will come as soon as they can make and manage them without our help. Coming up to Pekin from Tiestin I was surprised to look out of my boat and see telegraph posts stretching along the country, and learned that there had been a telegraph established between Tientsan and Tung Chou, a place 15 miles from the capital. It was erected under foreign supervision, but it is said to be worked entirely by Chinamen. China feels herself competent to work a telegraph, and has it not only from near Pekin to Tientsin, but from Tientsin onward to a river port near Shanghai. As soon as China feels that she can work a railway the railway will come. A great deal that is said about China being ready for railways is premature. There is hardly a place in the north of the empire where a railroad would pay. What China wants first is good roads. After some 10 or 15 years of good roads an intercommunication traffic will spring up which will call for railways, but at present no such traffic, except perhaps on one route, has been developed, and a railway, if built to-morrow, would stand rusting its rails in idleness. It is all very well for merchants and speculators to call for rapid advance and improvements, but any one taking a fair and dispassionate view of the matter will, especially if he has any sympathy for the Chinese, feel that rapid advance and the sudden introduction of railways would be anything but wise and patriotic on the part of China.—*Pekin Letter to the Pall Mall Gazette*

A tremendous gas well was struck the other morning on the Emory farm in Washington county, Pa., at a depth of 1,240 feet. The well is owned by a party of Pittsburg capitalists.

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AND

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Congressman O. B. Potter told the Aqueduct Commission recently that he had not found one prominent engineer who would give an opinion as to the cost of the Quaker Bridge Dam. This is not to be wondered at considering the very meagre information concerning its details that has yet reached the public, both lay and professional. The proposed dam, 200ft. high, is somewhat too complicated in its features, and immense in the figures involved, for any engineer to pass judgment upon hastily or without due study.

We are not surprised at the failure of Mr. Potter to find his experts outside of the Commission, since this Commission has before it the plans approved by such prominent Engineers as E. S. Chesbrough, J. B. Jervis, Julius W. Adams, Robt. K. Martin, and Isaac Newton, assisted by Chief Engineer Church and his entire force the plans when exhibited will probably meet the approval of the "prominent" engineering public. If they do not we hardly see where, in our own country, higher authority can be consulted.

Annual Report for 1883, of Kansas City, Mo.

We make the following extracts from the annual report for 1883, of Wm. B. Knight, City Engineer and Water Commissioner:—$478,750.06 was the total expended on public works in the year; of this amount $144,821.18 was for paving, and $141,927.15 for sewers. The length of sewers constructed was $7\frac{18}{100}$ miles, making the total laid 21¼ miles, at a total cost of $445,748.48. A number of new sewers are recommended.

For street improvements the average contract price in 1883, for new curbing was 82cts. and for curb and gutter $1.16 per lineal foot. The cost of street paving with cedar blocks and in-concrete base, ranged in the year from $2.31½ to $2,95 per sq. yd.; McAdam paving 63½cts. to 78½ cts. per sq. yard.

By the National Water Works Co., 6.51 miles of pipe were laid in 1883, the total pipe laid is 47.07 miles. There are now 3,350 service taps; and the average daily consumption is 3,722,000 gallons.

PANAMA CANAL NOTES.

Work done in February, 1884 800,000 cu. y.ls.
Total work done to the end of February, 1884, 5,254.045 " "

According to a dispatch dated Feb, 12. the third Huerne Dredge had arrived at Panama. The dredge now under contract at Philadelphia, to replace the *Prosper-Huerne*, burned on Jan, 13, is to have a hull of iron, and throughout its entire construction iron will replace the woodwork of the original model as much as possible. This dredge is expected to be finished and at work by June 1, 1884. The Panama *Star and Herald* gives well merited praise to Mr. H. B. Slaven, the American contractor, for his energy in replacing the lost dredge.

During the month of February—10,580 tons of canal material were discharged at the general magazine at Colon, brought from Europe or the United States.

The Panama R. R. has now a total of 997 freight cars at its disposal, 122 platform cars and 39 box cars having recently been added by the Canal Co.—*Bulletin du Canal Interoceanique.* March, 15, 1884.

LIVERPOOL ENGINEERING SOCIETY.

The fifth meeting of the session was held on Wednesday evening, March 12th, at the Royal Institution, Colquitt street. The president, Mr. R. R. Bevis, junr., in the chair, when a paper entitled "Compressed Air in Connection with Sewerage Works," was read by Mr. T. Longdin.

The author commenced his paper by pointing out that owing to the rapid increase of population in this country it has become the duty of all authorities having the carrying out of public health acts to provide good and sufficient sewers to carry away the liquid residuals from their districts, and from the constant outbreaks of disease which has been proved by the highest medical authorities to have been brought about by faulty construction and the negligence in designing of drainage works and ignoring those Hydraulic laws which are essential to secure a sanitary condition of things.

In designing schemes of drainage many difficulties meet the engineer to prevent him obtaining those gradients which are absolutely necessary to permit rapidity of movement of the sewerage, but this can be overcome by the application of "Shone's Ejectors," having for their motive power compressed air, which can be conveyed in iron mains to any part of the town or district, where ejectors receiving the sewage would be placed, which ejectors work automatically and accommodate themselves to the flow of the sewage. By this means difficulties caused by the physical outline of any town or district may be overcome, and gradients got which will permit of these velocities being obtained which is requisite to keep the sewers free from deposit.

PERSONAL.

Mr. R. K. Wright, late an ensign in the Navy, is now in charge of the construction of the Gatun section of the Panama canal, extending from kilometer 4 to kilometer 16.

D. G. Blackman, has been appointed Superintendent of the Pueblo and Las Vegas division of the New Mexico Central and Northern Railroad, to take effect from April 1st.

Capt. James Otis, of Astoria, Long Island, died at Ironton, Mich. last week. Mr. Otis was Chief Engineer of the Street Improvement Commission of Long Island City.

Correction.—In announcing the election of City Engineer and Superintendent of sewers, of Bangor, Me., in Engineering News of the 29th ult, we made an error in the initials of Mr. P. H. Coombs, the officer elected, the name as we now give it being correct.

Johnstown, April 2.—The Board of United States Engineers, consisting of Lieutenant-colonel Wm. P. Craighill, Lieutenant-colonel William E. Merrill and Captain James C. Post, who met yesterday in Pittsburg, for the purpose of examining models for river improvements, visited Johnstown to-day, accompanied by members of the Engineers' Society of Western Pennsylvania and the Pittsburg Chamber of Commerce. The party consisted of nearly 200 persons. The visitors inspected the immense iron works here, and were entertained by the Cambria Iron Company.

John Haugh, for many years a prominent street-paving contractor, was found drowned in the Patapsco River, near Baltimore, on March, 27. Mr. H. was about 60 years of age, and a man of considerable means and influence. It is not yet known whether his death was occasioned by accident or suicide.

William M. Strong, civil engineer, slipped in ascending the stairs of his house in New York, on March 28, and broke his neck in the fall.

Mr. Strong was born in Hartford, Connecticut, about 65 years ago; for a time he held a position upon the Rensselaer and Saratoga R. R., and was afterwards connected with the Boston & Albany R. R. During the war he was Government Inspector of Engines at Albany, and afterwards Superintendent of Motive Power on the N. Y. & Harlem R. R., retiring from this position about five years ago. He was the inventor of many improvements upon locomotives.

OBITUARY.

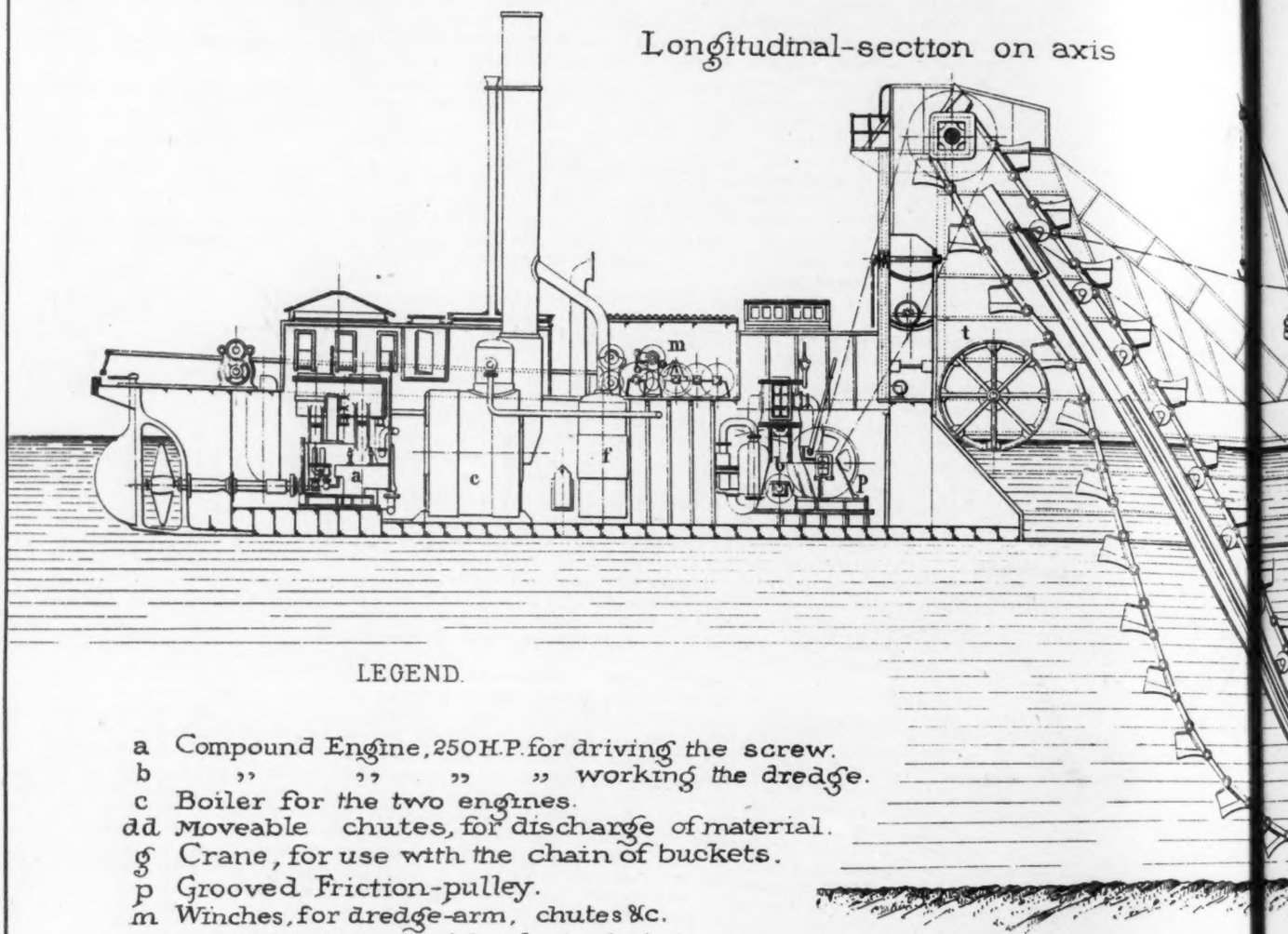
Edward Haight Phelps, late Chief Engineer of the Michigan Central R. R., whose death, on March 20th, we have already noted, was born in Middleburg, Vt., June 30, 1847. He was the son of Edward I. and Mary Haight Phelps, and grandson of Senator Saml. S. Phelps and of Judge Haight. In 1866 he entered Yale College, and graduated in 1870. Selecting Civil Engineering as a profession, he entered the Engineering Department of the University of Vermont, and received his degree of C. E. in 1872.

After completing his technical course, he spent a year in Europe, gathering useful information; upon his return he spent a short time upon the New York and Montreal R. R., but was soon after made City Engineer of Burlington, Vt. He was next assistant to Chief Engineer Hale in the building of the Burlington & Lamoille R. R. In 1878 he made surveys and plans for the complete reconstruction of the Panama Railway, including a new system of water supply for Panama. In 1880 he was appointed Chief Engineer of the Jackson, Lansing & Saginaw division of the Michigan Central R. R., and in 1883 was promoted to the position of Chief Engineer of the entire Michigan Central system, with its 1,500 miles of road.

His last work was in connection with the Niagara Cantilever Bridge, more particularly with its approaches and its connections.

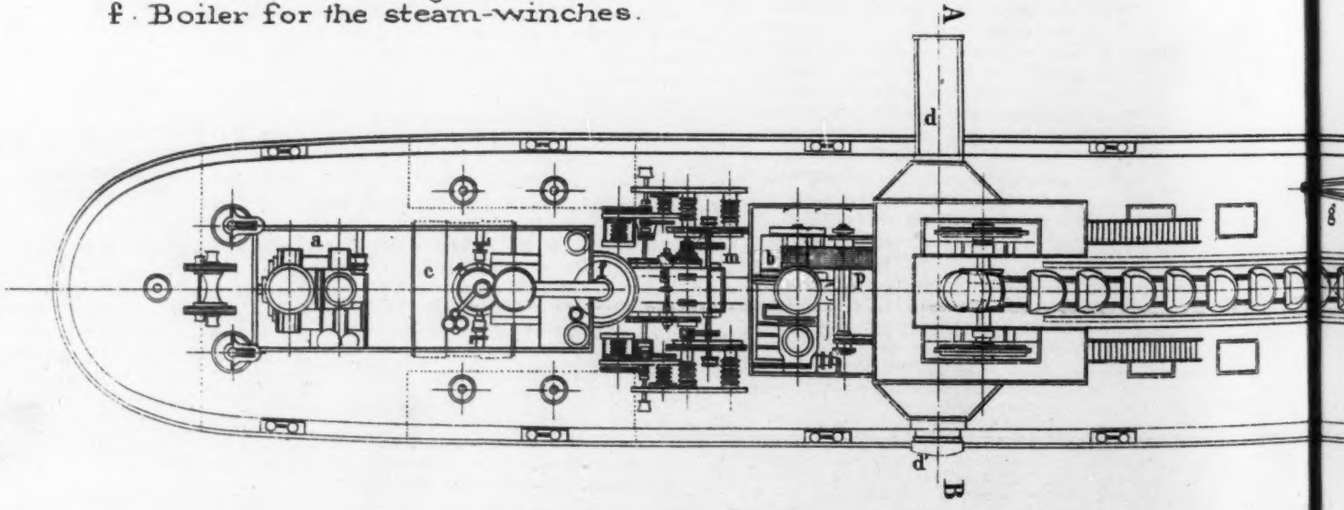
The Board of Directors of the Indiana University opened on March, 25, bids for the two college buildings to be located on the new campus at Bloomington. The bids received were: Moellering & Beverforden, Ft. Wayne, $64,953; P. H. McCormack, Columbus, $66,590; H. J. Nichols & Sons, Bloomington, $59,982; Charles Pierce, Indianapolis, $64,800. The bid of H. J. Nichols & Sons was accepted. The two buildings are to be finished by December, 1884. Each will be fire-proof, two stories, with basement, brick, with stone finish. The larger building, 108 by 38 feet, is for the Department of Chemistry and Natural Philosophy; the other for the Natural History Department.

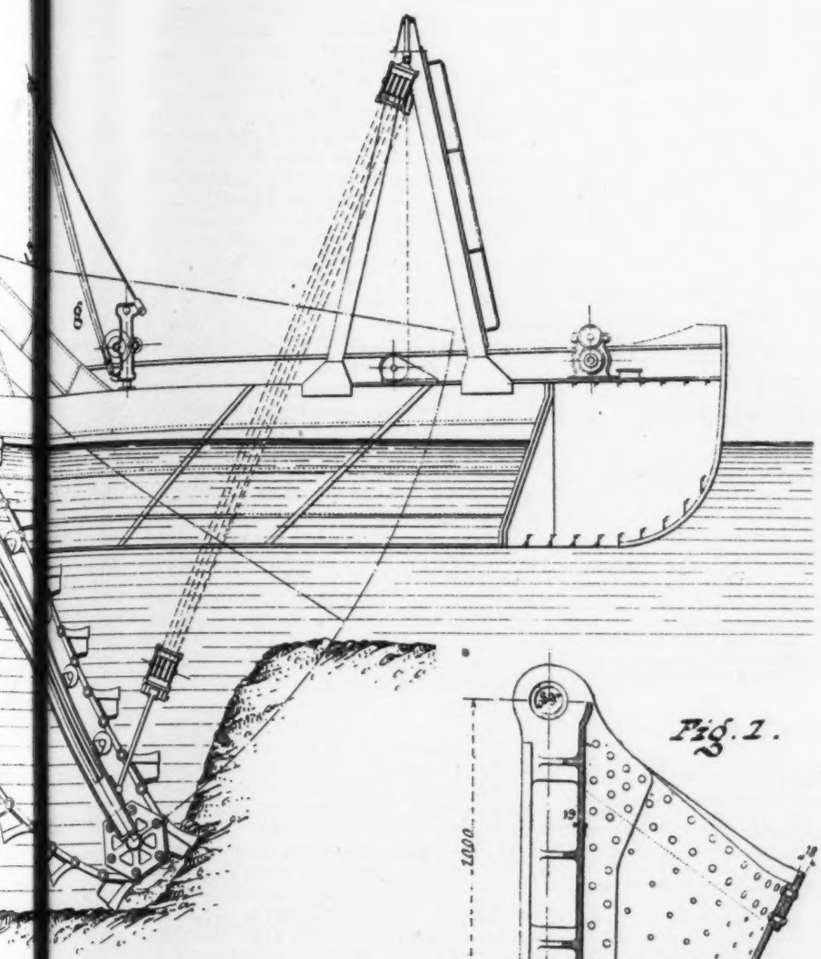
Longitudinal-section on axis



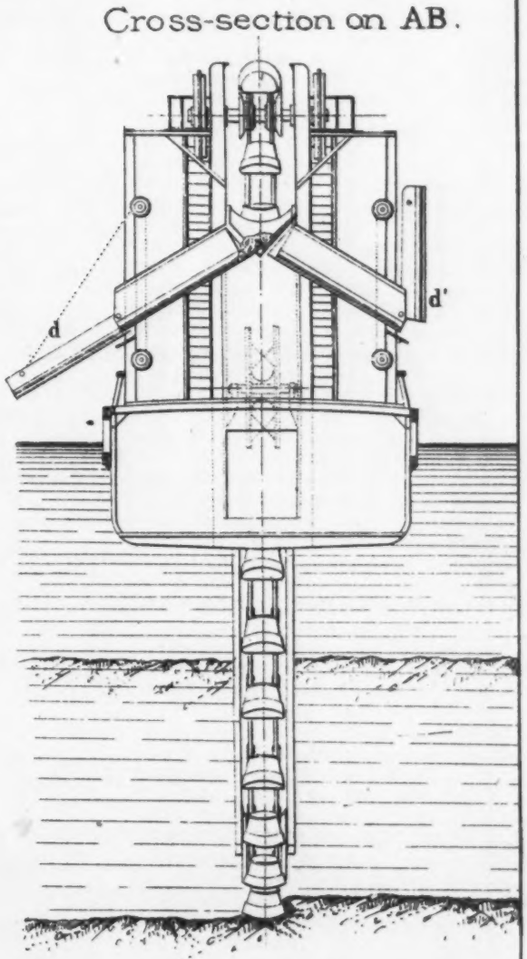
LEGEND.

a Compound Engine, 250 H.P. for driving the screw.
b " " " " working the dredge.
c Boiler for the two engines.
dd Moveable chutes, for discharge of material.
g Crane, for use with the chain of buckets.
p Grooved Friction-pulley.
m Winches, for dredge-arm, chutes &c.
t Drum for returning bucket-chain.
f Boiler for the steam-winches.





Cross-section on AB.



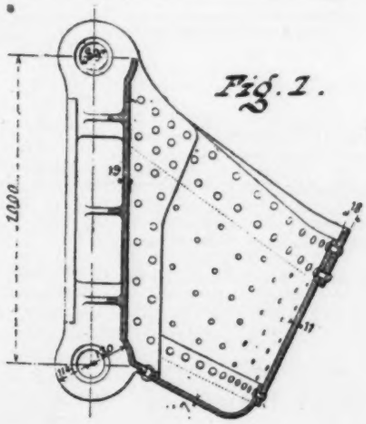
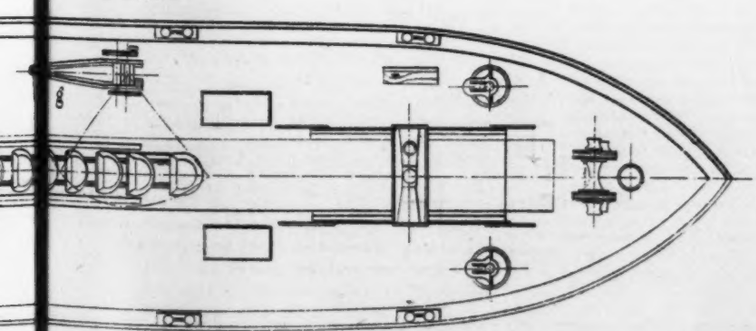


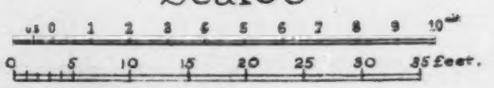
Fig. 1.

Plan.



THE MARINE DREDGE
OF THE
PANAMA CANAL CO.

Scales.



THE OHIO FLOODS.

From November to May, the valley of the Ohio is exposed to floods produced by rain storms, with or without snow thaws. As a rule, these do not reach an extreme height, so as to produce very great damage, and ten feet or so below extreme height, they pass along comparatively safe.

But occasionally the snow thaws, or precipitation of the less cultivated and mountainous basins above Pittsburg, are discharged so as to reach the flow from the basins above Cincinnati before their supply has passed down the river, and the result is an enormous and swift wave of about 400 miles base, with an average speed of about two and one-half miles per hour, and a crest speed of five or six miles, surging up to unusual height and sweeping destructively along the river channel.

Investigation shows that these cases are not regular; that the periods of extreme heights are short; that the quantities in excess thus formed is not very large; and that a proper method of keeping it back would serve two important ends, the protection of comfort, health, life and property in the flood time, and the improved navigable depth of the river for the ninety days, or so, of low water.

When a hydraulic engineer is called on to regulate the water supply of a city, to feed a canal, to maintain mill power, or any similar regulation, from time immemorial and all the world over, the use of reservoirs, natural or artificial, is the rule. All ordinary water courses offer more or less convenient means for such structures, and their construction and control is a matter of plain and simple operation.

When, then, a great calamity like that which at various times has visited this valley, wakes the sympathy of a whole nation, the question is asked in all the public prints, "what is the remedy for this?" It is not right, nor is it professional to reply: "There is no remedy for such a case; it is likely to grow worse than better; and the usual rule of the profession cannot be applied, because a distinguished hydraulic engineer cannot find precisely six sites for as many reservoirs of a fixed capacity, or inspection, without survey."

Those of us who have become familiar with Allegheny summits, by personal inspection, by dili ent collation of surveys, and through our field parties know that numerous valleys are to be found there, of such streams as the Mahoning, Red Bank, Tiowesta, Kinzua, Potato Creek, Conewaygo, and others, in an area of over 5000 square miles, highly favorable for storage for such a purpose; the construction of auxiliary reservoirs for the Monongahela navigation has long been contemplated.

On the area below Pittsburg, such an affluent as the Kanawha, has been carefully surveyed. The report shows a highly favorable main channel for 95 miles, with banks generally 40 to 60 feet high and with a fall of 135½ feet; and that on one branch, the New River, a single reservoir can be built, to control 10,722,000,000 cu. ft. at a cost of $533,200, and the Greenbrier, will add to this 3,337,000,000 cu. ft. With four dams and locks, at a total cost of about $2,000,000, this river can be made navigable, and so with an outlay of $3,658,700 in all as to give the Ohio below it 6 feet summer depth. (Chief Engineer's Rep. '73 p 841.)

The late Chas. Eliet, Jr. in his examinations at Wheeling, for six years, 43' to '49, found that in the exceptive case of 1847, a reserve of 44,196,000,000 cu. ft. for nine days time, about 25 feet, would have kept the crest down to this safe line, and in the low run, maintained 5 feet depths, for 50 days; and there is little question that such a reserve would have a powerful control over the dangerous flood crests.

In 1867, knowing from childhood the destructive operation of Hudson river floods at and above Albany, in my report of the improvement of that river to State Engineer Goodsell, I urged the importance of surveying the upper basins for reservoir control. Prof. Benedict's report in 1874, shows the entire feasibility of impounding 18,140,997,000 cu. ft. at an estimated cost of $426,572, which is less than the damages sometimes caused by a single flood.

For the improvement of the upper Mississippi, an engineer like Gen. Warren, recommends three reservoirs, at a cost of $114,000, to impound 54,006,872,830 cu. ft. and give St. Paul four feet continuous navigation. (Chief Engineer, 1870, p 284).

I think, therefore, there is but one solution to the Ohio problem, and until those who oppose the usual remedy show another that is better, the people of this valley owe it to themselves, to urge diligent survey of other affluents, like the Kanawha, which will enable them to emasculate these occasionally destructive waves of their chief power.

Yours Respectfully,
SAMUEL Mc ELROY. C. E.
170 Broadway, New York.

CORRESPONDENCE.

CONSTRUCTION OF RACE COURSES.

BATON ROUGE, March 21. 1884.
Special Correspondence Engineering News.

EDITOR ENGINEERING NEWS.—I cannot find in any engineering books I have, any information about laying out and building race tracks. If any of your readers who have laid out race courses for trotting horses, will answer the following questions, they will confer a great favor on one of their fellow-workers.

1st. Is there any book, pamphlet, or report which gives full information about laying out and building race-courses?

2d. Is the best form for a race track for trotting horses two parallel tangents connected by parabolic curves?

3d. What is the best formula to calculate those curves so that the length will be exactly a mile or half a mile and which is the best practical method of laying those curves out on the ground?

4th. How far from this center line is the inside fence put up, and how wide is the track generally made?

5th. What inclination to roadway ought to be given round the curves, as the inside ought to be lower than the outside of the track?

6th. Will good clay, well rolled and drained, make a good track, and make a so called fast track, and whatever further information your readers are willing to give will be gladly received

R. SWART. C. E.

Increase of Error in Long Lines of Level.

NEW BRUNSWICK, N. J., March 18, 1884.
Special Correspondence Engineering News.

EDITOR ENGINEERING NEWS:

Having read Kappa's inquiry as to the rate of increase of error in long lines of level, I will give the results of an experience covering about ten thousand miles of leveling done by me or under my direction in prosecuting the topographical survey of New Jersey. I have never found that the error is at all proportional to the distance and have usually found the error as great in runs of five miles as in fifty miles, in good leveling. I can give many instances of tests when the error is *nil*, but I do not regard these runs better than those which show a small error, for I know that they were run with no more care, and believe that if tested at some other points they would show as great errors.

Believing that there is need for a good practical standard for leveling I will take the opportunity to ask for opinions on this subject. Rankine says that the errors may reach one foot in forty miles. There are many other similar limits given which I need not quote. We usually have two systems of levels. A primary system, run with fifteen inch level, and correct to 0.10 foot; and a secondary system, run with light 11 inch instruments. (Gurley's Architects). The standard adopted for the latter is 0.25 feet error, in secondary tests made in about every five miles; and tests made ultimately on the primary B. M.'s show that errors to this extent do not accumulate objectionably; while the standard is quite readily maintained, even with such light instruments. Hence I believe that this standard is a practical one for distances up to fifty miles, and is as high as should be adopted for all ordinary practice. Hoping to hear from others on this subject, I am yours,

C. C. VERMEULE, C. E.

The Marine Dredge Used at Colon, on the Panama Canal.

(*See Illustration.*)

As we have already fully illustrated and described the American Dredge used in digging the Panama Canal proper, we now show the marine dredge employed in excavating in the deeper water at the entrance port of Colon. The following is taken from *Le Genie Civil* of Jan. 26.

At Colon, on the Atlantic side, the channel to be opened between water 29½ ft. deep and the mouth of the canal on solid ground, is not of great extent. But it was necessary, in addition to this channel, to dredge out to the same depth all the approaches to the *terre-plein;* and in time the port itself should be prolonged inland for about 1¼ miles, with a width of 1,600 or 1,700 ft.

The dredges employed upon the canal could not work to advantage in a position exposed to the winds and tides of the coast; and it became necessary, to obtain continuous work, to design a special machine adapted to the required duty. The dredge here shown and the hopper-barges were constructed by the Messrs. Lobnitz, at Renfrew, Scotland.

For consideration of economy in transport, and the advantage of mounting the machinery complete at the work shops of its makers, the hull was designed and equipped with the view of making the voyage from England to Panama. This, of course, required special provisions, not usually found in dredging machines.

The hull is of marine form, and measures 170 ft. in length; the greatest width is 26 ft., and the depth of hold is 12 ft. When in service the draught of water is 9 ft. 2 in.

The well, in which the dredge works, is practically on the centre line of the hull, and is closed at both ends, as under the conditions, the bow could not be separated into two parts, as is usual. This arrangement limits the movement of the dredge as shown in the illustration. The width of the well is 6 ft. The thickness of the plate-iron used in the sides of the well is $\frac{7}{16}$ in., and in the hull the plates range from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. The deck is made of 3 in. pitch-pine. Outside, the hull is protected by wooden wale-pieces united by vertical posts, the latter, which would have interfered with navigation, being put in place after reaching its destination.

The frame work supporting the axle and machinery for revolving the chain of buckets, is made of iron plates $\frac{7}{8}$ in. thick strengthened by angle-irons. The height of this frame-work, up to the axle, is 24 ft. 3½ in. above the deck, or 28 ft. 10 in. above the water level.

Attached to this frame and leading right and left are the conductors for the dredge material; these are made of iron plates $\frac{7}{8}$ in. thick and are lined with steel to resist the constant friction of the descending material. The conductors have an inclination of about 30 degrees to the horizontal, and are moveable to a certain degree, being so articulated at the upper end, as to discharge the contents on the centre of the hopper-barges. The moveable portions of the conductors are easily handled by a small derrick. An apron of steel plate riveted to a strong base of iron and wood and manipulated by a long lever, enables the workmen to direct the dredged material into either conductor, at will. The iron sides of the dredge-tower are extended forward, on an oblique line, and are attached to the sides of the well, making a strong brace in the direction of the greatest strain.

Further forward, and rising 31 ft. 2 in. above the deck is another frame-work in iron, of great solidity. This is intended to handle the dredge arms and the chain of buckets. A revolving crane, upon the deck, serves for any minor manipulation of the buckets.

The engine used for supplying the necessary power is a vertical compound, with cylinders of 21.4 in., and 42.8 in., respective diameter; the stroke is 24.4 in.; it is a surface condensor. At 90 revolutions the engine develops 250 horse-power. All the levers and controlling machinery of the engine are above the deck.

The boilers are cylindrical, return tubular; they are tested for 71 lbs. per sq. inch. A small vertical boiler, with 86 sq. ft. of heating surface, and tested to 85 lb. to the sq. inch, is provided so that the dredge can be moved when occasion requires it without firing the large boiler.

The dredge-arm is made of two iron beams, built of plates and angles, and is 65½ ft. long, permitting the dredge to operate in 36 ft. of water; in the centre the beams are 3 ft. 3 in. wide. The two beams are placed 4 ft. 7 in. apart, and are stayed in their length by five iron plates ⅞ in. thick.

The different positions of the dredge-arm are controlled by the combined action of a sliding arm in which the axle of the upper end of the dredge-arm is fixed, and its revolution about this axle in a vertical plane.

As the dredge is exposed to the action of the waves, some plan had to be adopted to prevent the bumping of the dredge-arm against the bottom. If the point of articulation was fixed, this point would receive all the shock; if on the other hand the dredge-arm was absolutely free to slide in the grooves provided, the arm would be violently projected upwards, and striking the ends of the guides would bring about certain rupture.

The arrangement adopted avoids these dangers. Having first placed the pillow-blocks of the axles at the top of the dredge-arm at the height required by the dredging, their descent is stopped by passing a bolt under them and through the cheeks of the guides. These last enclose at their upper ends, springs of 40 tons resistance and a movement of 4 in. The space between these springs and the moveable pillow-blocks is filled by a chock of wood.

At its lower end the dredge-arm is fitted with a hexagonal drum, over which pass the chain of buckets; it is mounted upon an axle 7 in. in diameter. The steel axle at the upper end of the chain of buckets, with its square drum, is 12 in. in diameter at the centre, and 10½ in. at the journals.

The buckets (Fig. 1) used, are proportioned to the rough usuage expected from them, and in general form embody the long experience of the Messrs. Couvreux & Hersent, who in this matter advised Mr. Lobnitz. They have a capacity of 14 cubic feet, and the metal is ⅞ in. thick, with a steel cutting edge ¾ in. thick. The bottom is of cast steel ¾ in. thick, and include the female links cast with it, with flanges by which it is rivited to the sides. Each section of the chain of buckets contains one bucket with the female attached, and two male links of forged steel, united by four bolts, each 3½ in. in diameter; the links are 3 ft. 3 in. long from centre to centre of eye. The male links have a section of 2×7 inches.

The drum, shown at "t" on the general elevation is an invention of Mr. Hersent, for supporting the chain of buckets. This drum is 9 ft. 10 in. in diameter, and is mounted in the interior of the dredge-well upon iron pedestals, which can be shifted so as to vary the position of the dredge chain.

This appliance presents two very important advantages; in large dredges, where the chain of buckets is long and heavy, the tension upon the under portion can not be made sufficient to prevent this part from assuming a curve, the upper end of which approaches a vertical line.

As the buckets must be emptied above the chute, and must return under the upper drum, without striking the edge of the chute, unless a supporting drum is used, the upper axle of the bucket-chain must be placed at a great height, interfering with the stability of the dredging boat. Furthermore, unless some arrangement of this kind is made, the bucket-chain is liable to slip on the upper drum, which would turn without moving the buckets, unless this drum was provided with lugs.

All the machinery for manipulating the dredge is grouped upon the deck, so that the men in charge can easily observe the work to be done, and receive the orders of the foreman.

The dredging-boat is propelled by a screw operated by a compound engine of 250 horse power, similar to the one used for the dredging. The two engines are so coupled that the one driving the screw can be applied to the dredging, should circumstances or accident require it. The same boiler provides steam for both engines. The speed attained with a steam pressure of 70 lbs., was 8 knots per hour. The coal consumption was 2.2 lbs. per horse-power per hour.

In crossing the Atlantic, the dredge was provided with mast and sails, the dredge-arm was deposited upon the deck, and the dredge-well was tightly closed below, and covered above; it served to carry a supply of coal. The dredge put to sea, for Colon, on April 10, 1883; upon the 19th it reached the Madieras, and departing on the 21st, reached Colon on May 16. The total distance was about 7,500 miles, made in 33 sailing days.

The price of the dredge, in service, was $88-000. Two others, like it in all respects have been ordered by the Canal Co., one to go to Colon, the other, across the Atlantic and by way of the Pacific, to Panama.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E. : M. INST. C. E.

(*Continued from page 153*)

DCXII. ATLANTIC, IA.

Atlantic, Iowa, in lat. 41° 20′ N. long. 95° W. is the County Seat of Cass County, and is on rolling prairie ground on Troublesome Creek. Settled in 1869 it was incorporated a city of the 2nd class in 1877.

Water-works were built by a private company in 1882, after plans of P. Cowell, taking the supply from the creek, an impounding reservoir being formed by a stone dam, and pumping directly into the mains by a Holly steam pump. The water is filtered, but apparatus is not described. Distribution is by 5½ miles of cast-iron pipe of 20.16 and 8 inches diameter, with 65 fire-hydrants for which the city pays $4,080 a year. Service pipes are of iron.

The population in 1880 was 3,662; it was now said to be 5,000. The number of taps and daily comsumption are not given. The capital stock of the company is $100,000. The works have cost about $73,000. The bonded debt is $50,000 at 6 per cent. interest. The receipts in 1883 were $6,500; the expenses of maintenance are not stated.

The works are managed by a board of seven directors; J. C. Yetzer is President, and L. Young, Secretary.

DCXIII. GORHAM, N. H.

Gorham, New Hampshire in lat. 44° 23′ N. long. 71° 10′ W. is in mountainous country on the Androscoggin River.

Settled in 1800 it was incorporated a town in 1836. Water-works were built in 1873, by a private company, the supply being taken from springs. A reservoir 16ft. by 12ft, by4½ft. built of bricks and cement, and being 130 feet above the town, receives the water.

Bored pine logs were first used for distribution, but in the summer of 1883 they were replaced by 1¾ miles of cast iron pipe of 4, 3, & 2 in. diameter with 9 fire hydrants, 12 gates, and 70 taps. Service pipe is of galvanized iron. The town pays $15, yearly for each hydrant. The population in 1880 was 1,383.

The capital stock of the Co. is $2,950. The bonded debt is $3,300 at 6 per cent. The cost of the works has been $14,316. and the receipts to Dec. 1st 1883 were 11,016

The expenses in 1883 were $5530, and the receipts $1515.

Warren Noyes is the President, and Thos. E. Fisk, Secretary.

DCXIV. UNADILLA, N. Y.

Unadilla. Otsego Co., New York, in lat. 42° 20′ N., long. 75° 20′ W., is on the Susquehanna Riv r.

Settled prior to the Revolutionary War, it was organized in 1792, and incorporated a village in 1827.

Water-works were built in 1880 by Samuel North as a private enterprise, chiefly for fire protection, after plans of Peter Hogan, the supply being taken from springs.

The water is collected in a reservoir 100 ft. long, 56 ft. wide, and 7 ft. deep, constructed in embankment with puddle walls, and having an elevation of 150 feet above the main street of the village, and passes to the pipes through a sponge filter. One mile of asphalted wrought iron pipe of 6 and 4 in. diameter is laid, with 5 fire hydrants, 3 gates, and 12 taps. It has, however proved so unsatisfactory that the water is only turned on in case of fire, and it is soon to be replaced with cast iron. The service pipes now laid are of iron and lead.

The population in 1880 was 922. The works have cost $4,500. Samuel Worth is the owner and manager.

DCXV. OLYMPIA, W. T.

Olympia, Thurston Co., Washington Territory, in lat. 47° 2′ N., long. 122° 45′ W. is in a rough and heavily timbered county on Puget Sound.

Settled in 1848, it was incorporated a town in 1861.

Water-works were built in 1866 after plans and under the direction of W. N. Horton. The supply first used was from springs, but now the water is taken from Morlie Creek, and is pumped by a six inch double plunger steam pump, made by W. G. Garret, lifting 190 feet to a reservoir having a capacity of 3,000,-000 gallons. Until 1878 the water was distributed by bored logs, but during that year they were replaced by 8½ miles of the Horton wood pipe of 8 to 4 in. diameter, with 11 fire hydrants, 6 gates and 200 taps. Service pipes are of galvanized iron. The town pays $660 yearly for hydrants. The population in 1880 was 1,232, it is now said to be 2,500. The daily consumption in 1883 was 60,000 gallons.

The capital stock of the company is $30,000. There is no bonded debt. The cost of the works has been $20,000. The total receipts have been $35,000. The expenses in 1883 were $2,000, and the receipts $5,000.

H. G. Struve is President of the company, and W. N. Horton, Superintendent.

DCXVI. JAMESBURY, REFORM SCHOOL, N. J.

The New Jersey State reform school in lat. 40° 25′ N. long. 74° 25′ W. was established at Jamesbury in 1860, and is on a generally level farm of 500 acres.

Water-works were built under the direction of James H. Eastman, the supply being taken from springs.

The water is conducted in 6 inch tile and terra cotta pipes 1800 ft. to the pumps, of which there are two, the larger being a Knowles Steam pump having a capacity of 500 gallons per minute, and the smaller built by Guild and Garrison, having a capacity of 60 gallons per minute. These pumps lift the water 52 ft. to two reservoirs, one of brick holding 12,000 gallons, and one an open pond holding 170,000 gallons. The ordinary pressure is 35 lbs. which by direct pumping can be raised to 200 lbs.

Distribution is by 1¼ miles of wrought-iron pipe of 4 in. diameter, with 3 fire hydrants, 3 gates and 7 taps. Wrought-iron is also used for services.

The population supplied is about 400. The daily consumption in 1883, was 25,000 gallons. James H. Eastman, Superintendent of the Institution, has charge of the works.

WATER.

SAC CITY, Iowa, has voted in favor of water-works.

THOMAS F. LENNON has been chosen Inspector of the Lowell Mass. Water-works.

OREGON is the one dry State in the Union. The last 12 months has been the dryest within memory of man; and there has not been a freshet since the winter of 1882-3.

THE Corsicana, Tex., Water-works Company, having failed in their efforts to obtain water, propose to put $30,000 more into the plan provided the city will give a like amount.

A DITCH to be cut in Arkansas Valley in Colorado will take so much water out of the Arkansas River that the stream will not cause much trouble hereafter in the way of floods. It is to be 65 feet wide at the bottom and 65 miles long.

WORCESTER, Mass., March 28.—A new reservoir dam at Spencer, built by the Water Power Company at a cost of $10,000 to compensate mill owners for the taking of Shaw Pond, gave way Thursday.

PROVIDENCE, R. I., March 28.—The dam at Sandy Hill Mill, Davisville, North Kingstown, give way early this morning and the pond went out, washing away the flume and abutments of the highway bridge filling the cellar of the mill with water

THE Board of Water Commissioners of St. Paul, Minn. has awarded the contract for the new pumps and engines to Messrs. E. Allis & Co., of Milwaukee at $28,000. The large pump will be working by October 1st. It has a capacity of 3,000,000 gallons per day.

THE Citizens of Dobb's Ferry, N. Y., want a Public water supply. It has not yet been decided whether they will bond the village for $50,000 required for new works, or obtain the supply from the artesian well of Cyrus W. Field, which well is said to yield 90,000 gallons per day.

THE new reservoir site, in Washington, D.C., has been formally condemned at a total appraisement of nearly $200,000; of this amount the Howard University gets $98,136.25, and George E. Moore $54,733, the remainder of is divided into small sums among a number of holders.

THE Committee on Water Supply, Mass. Legislature gave a hearing on the petition of Winslow Warren and others for such a change in the law in regard to aqueduct companies that any person or corporation shall be prohibited from entering a city or town having a water supply to lay pipes to supply the inhabitants with water unless special legislation to that effect be had.

THE Olcutt Falls Company is now developing one of the most valuable water privileges in New England, in towns of Hartford, Vt, and Lebanon, N. H., comprising 1¼ miles of the Connecticut River. The Connecticut at this point varies in width from 300 to 1000 feet and has great natural advantages for mechanical utilization. The natural fall for the first 120 rods is 24 feet, and it is estimated that the falls have 10,000 horse power at this point, or sufficient to run 10 cotton mills of 10,000 spindles each.

ATLANTA, Ga., with 30,000 inhabitants, is in perplexity over its water supply. The present water-works, built at a cost of $500,000, fail to meet the demand; $3,000,000 has been lost within two years owing in a great measure to inadequate water supply. Among the plans of relief suggested was a canal from the Chattahoochee River, tapping the river 60 miles above Atlanta; this would have furnished all the necessary water without doubt, but the city of Columbus on the banks of the Chattahoochee objects. This latter city has invested $5,000,000 in cotton mills depending upon water-power, and has raised the very good point that the waters of a natural river-way, in which millions had already been invested, could not be diverted to benefit a city far removed from the river-bed. Under legal advice, Columbus has a good case against Atlanta, and the latter city must look elsewhere for a supply.

DURING the past year the average quantity of water supplied to London was 145,000,000 gallons per day, of which 72,000,000 gallons, or nearly one half, were taken from the Thames while of the remainder nearly the whole was obtained from the River Lea, and only a comparatively small amount from deep wells sunk in the chalk. In a paper recently read before the Society of Arts, Dr. Frankland showed that much of the water derived from the Thames is contaminated with sewage and other objectionable matter, and that such water might at any time carry with it infection. The trouble seems to be, that nearly all the towns in the Thames basin reject the river and its tributaries as a source of water supply, but employ springs and deep wells for that purpose; and the great obstacle in the way of a similar supply being obtained for the metropolis is the magnitude of the capital invested in existing works, the interests of which capital are at present allowed to override all other considerations.

THE City Councils of Minneapolis have fixed the following water rates for that city:

For candy and ice cream factories $10 each. For carriage shops, five dollars employing not over five men; $10 for shops employing not over ten men, and $15 for all others. Cooper shops $15 for employing not over fifty men; $25 for shops employing not over one hundred and $50 for all others. Churches $5 each. Laundries, employing not over ten persons, $15; not more than twenty persons, $25; all others, $40. The rates for rooms, exceeding five, in boarding houses, was fixed at 25 cents each; for manufactories not otherwise taxed, $5 per annum; for offices the rates were reduced from $3 to $2, and from $5 to $3; for photograph galleries $15. The price to be charged the Nicollet House was changed from $750 to $500. The rate for restaurants was fixed at $15; stores for the sale of liquors, $35; saloons for the sale of liquors, $15; saloons connected with restaurant, $25; saloons connected with billard room or bowling alley, $25; vinegar factories, $25.

The charge on persons living in tenement houses obtaining water outside the premises was changed from $3 to 50 cents per annum. The clause forbidding all persons from drawing water from the city mains during a fire, except for the extinguishment of fires was stricken out. The rates for sprinkling lawns were changed from $5 to $3, from 75 cents to 40 cents, and from 50 cents to 25 cents, according to the size of the lawn.

ON Friday, April 18, sealed proposals will be received at the St. Paul City Comptroller's office for $500,000 5 per cent, St. Paul Water Works extension bonds. The last bonds sold at a premium of 1¾ per cent., and as the revenue of the water service is now great enough to pay the interest and face of the bonds on maturity, independent of the general tax, it is expected this issue will sell still higher.

CHIEF ENGINEER LUDLOW of the Philadelphia Water Works, reported that he had a final proposal from the Bell Waterphone Company to sell outright or lease their newly-patented system to stop leakages. The system can be bought for $12,500, or leased for one year for $5000 or for three years at the rate of $4000 per annum.

Colonel Ludlow recommended purchasing, and stated that the waste of water in Philadelphia by the carelessness of consumers was equal to about 40 per cent. of the total pumpage, and that, if introduced, the waterphone system will prevent much of the waste. The report was favorably considered.

By invitation of Chief Engineer Ludlow, the Committee, on Friday afternoon, (yesterday) made an official tour of the stations, to see the work accomplished during the past year.

THE American Water-Works Association will hold its Fourth Annual Meeting in Cincinnati, O., on April 15 to 17, next. The sessions will be held in Melodeon Hall, commenceing at 10 A.M. on the 15th, with an address of welcome by Mayor Stephens, and a reply by President J. G. Briggs of the Association. The following papers will be read and discussed during the convention:

"Water Waste in its Different Phases," Gilbert Murdock; "Pressure on Street Mains," A. H. Howland; "Filtration of Western and Southern River Water," M. L. Holman; "Hydraulic Elevators and Motors," B. F. Jones; "Special Appliance for Fire Protection," H. F. Dunham: "Cast Iron Pipes," Phineas Ball; "Mains Laid Under Streams," Carl Schon; "Annual Reports of Water-Works," L. H. Gardner; "Repairs to Pumps and Machinery," Thos. J. Whitman; "Rules and Regulations," Fred. E. Hoyt; "Water Meters," Edwin Darling; "Smoke Consumption," W. H. Hamilton; "Rules Governing Duty Test of Pumping Machinery," A. G. Moore and Harry Birkinbine.

Headquarters at the Gibson House. There will be excursions on the 16th and 17th, also a banquet on the 17th. The Reception Committee, are A. G. Moore, Thos. J. Bell and Cincinnati and Newport Iron and Pipe Works.

Mr. Ashley B. Tower of Holyoke is civil engineer for the Olcutt Falls company. The work of building the dam was begun in August 1882. It is in the form of the arc of a circle and is 608 feet long between abutments On the Vermont side the abutment is 200 feet long and 32 feet high. The abutment on the New Hampshire side is of natural formation. There are nine gates 8×10 feet in size, extending from the abutments on the Vermont side to a distance of 100 feet on the overflow. The canal is 500 feet long and varies from 10 to 20 feet in height. The masonry is of a most substantial and massive character and consists of over 6000 cubic yards of stone work. The work of construction on the first group of mills is now in progress. The tail races are nearly completed for the first wood pulp mill which will be of brick, 80×90 feet in size, two stories high, and have a daily capacity of ten tons. A force of masons are at work on the foundations, and two Ingersoll rock drills are being utilized in removing ledge rock for the feeder between the wheel pit and tail races. The feeder for the first group of mills will be 157 feet long and 37 feet wide. About 80 feet remains to be completed. It is calculated that this feeder will give a capacity of water sufficient to utilize 2200 horse power. The mill sites are all on the Vermont side. The first pulp mill will be in running order by July 1, and it is probable that the year 1884 will see several new pulp and paper mills in course of construction. Nearly $125,000 have already been expended on the work, and it is estimated that as much more will be laid out in developing the property.

S. S. Ordway & Company of Suncook, N. H., are the contractors for the mason work. The necessary stone for building purposes was quarried on the spot. The brick used are manufactured at Oxford, N. H. Comparisons made with the capacity of leading water powers in New England demonstrate the value of the privilege of the Olcutt Falls Company. The following figures are suggestive: Holyoke, 17,000 horse power; Cohoes, 14,000; Lewiston, Me., 11,000; Lowell, 10,000; Lawrence, 10,000; Manchester, 10,000; Olcutt Falls, 10,000.

AN artesian well is being bored at Tracy & Russell's Brewery, at Greenwich avenue and West Eleventh street, N.Y. The tubing has thus far penetrated 40 feet of sand, and 23 feet of red clay, when the mica rock was struck. The progress in this rock is about 20 feet in 24 hours; and the cost is estimated at from $7 to $9 per foot for a 6-inch tube. The foreman in charge, who has had much experience, spoke as follows to a *Times* reporter concerning well-boring in New York:—

"Drilling artesian wells is much the same as drilling oil wells. We use heavier tools because we can't build as high derricks. The rock in the lower part of New York is generally like this. Up town it is granite. I've known it to take six hours to drill one foot through granite rock. We have to go down from 400 to 1,000 feet to strike water in New York. We are putting down a well at Schaefer's brewery which is now down 255 feet and no water. We put down one in Owego 1,000 feet deep, and one in Boston, near the Providence Station, 2,505 feet deep. The greatest flow of water I ever knew from an artesian well was from a 500-foot well we put down for ex-Lieut.-Gov. Watson, at Dalton, Mass. That well is now flowing 10,000 barrels of water a day. Artesian wells are good investments for brewers, because the water is very cold. Where a large amount of water is used an artesian well costing $5,000 or $6,000 will pay for itself in one year."

GENERAL INSTRUCTIONS TO BIDDERS.—ISSUED BY THE PHILADELPHIA WATER DEPARTMENT.

1. "The person or persons who shall bid for public work to be done or materials to be furnished for or on behalf of the City shall, in the first place, enter security at the Law Department in the sum of Five Hundred Dollars ($500) conditioned that if his or their bid is the lowest, and he or they shall decline to do the said work or furnish said materials, he or they shall pay to the City the difference between the amount of his or their bid and the bid of them or him who shall actually perform said work or furnish said materials, and no bid shall be considered unless there be a certificate that the provisions of this Ordinance have been complied with. *Provided*, That this Ordinance shall apply only to bids exceeding in amount the sum of Five Hundred Dollars."—[Ord. May 25, 1860.]

2. Bids must be made in duplicate upon printed forms to be obtained at this Office.

3. The place of residence of every bidder, with Post Office address, County and State, District or Territory, must be given after his signature, which must be written in full.

4. When firms bid, the individual members must sign their names in full, giving their Christian names. The signers may, if they choose, describe themselves further as doing business under a given name and style as a firm.

5. All signatures must have affixed to them seals of wax or wafer.

6. All prices must be *written*, as well as expressed in *figures*.

7. Any one signing a proposal as the agent of another or others, must file with it legal evidence of his authority so to do.

8. Specifications need not be written out in full in the body of the proposal. The declaration that they are in accordance therewith will be sufficient.

9. Alterations, by erasures or interlineations, should be explained or noted in the proposal, over the signature of the bidder.

10. In submitting proposals, two envelopes, an inner and an outer, are to be used, and the inner envelope, containing the proposal, must be so indorsed as to indicate beforé being opened the particular work for which the bid is made.

11. If a bidder wishes to withdraw his proposal, he may do so before the time fixed for the opening, without prejudice to himself, by communicating his purpose, in writing, to the Chief Engineer of the Department, and when his proposal is reached it will be handed to him, or his authorized agent, unread.

12. Reasonable grounds for supposing that any bidder is interested in more than one bid for the same item will cause the rejection of all bids in which he is interested.

13. The City reserves the right to reject any or all bids, and to accept any bid that shall appear most advantageous to its interests or service.

14. Proposals from a previously failing bidder or contractor will not be entitled to consideration.

15. No bidder will be informed, directly or indirectly, of the name of any person intending to bid or not to bid, or to whom information in respect to proposals has been or will be given.

16. The bidder must satisfy the Chief Engineer of his ability to furnish the materials or perform the work for which he bids.

17. Information may be had by applying, in person or by letter, to this Office, but bidders are expected to obtain personally all the information in regard to the character of the work or material, which they may desire in making their proposals; and it is understood

that proposals are made with a full knowledge of the kind, quantity and character of the work to be done or materials to be furnished, and that no concession or allowance whatever will be made to the bidder or contractor for want of such information on his part.

18. The successful bidder will, within ten days after being notified of the acceptance of his proposal, be required to enter into a written *contract* with the City, accompanied with a sufficient joint bond and warrant of attorney with one or more securities, conditioned in half the amount of the contract, for the faithful performance thereof. [Ord. July 5, 1870.

19. Transfers of contracts or of interest in contracts are not allowed without the consent of Councils previously obtained.

20. Payments may be made monthly at the discretion of the Chief Engineer, a prescribed percentage, at his discretion as to cases and rates, to be reserved therefrom in suitable cases until the satisfactory completion of the whole contract, and to be forfeited in the event of the non-fulfillment of the same in the time and manner required.

21. Any failure to begin work at the time specified in the contract, or to prosecute it thereafter at the rate and in the manner required, or failure, in the case of materials, so to begin and continue their delivery, will be considered as allowing the City to annul said contract and declare a forfeiture of all reserved percentage or other dues, under the conditions stipulated in the contract.

NEWS OF THE WEEK.

Streets, Drainage, Sewerage, Etc.

YOUNGSTOWN, Ohio, has a sewerage system of the combined type; it was commenced about 1868, and has cost to date $177,500, James M. Reno, the present City Engineer, planned and executed the system. The main sewer is 7,900 ft. long, from 5 ft. to 7 ft. in diameter, is 12 inches thick of brickwork, and cost $98,362.17; the remaining 9,721 ft. of brick sewer ranges from 18 to 40 inches in diameter; the entire system is 7½ miles long, not including house connections and private sewers. Dr. McCurdy, at the Sanitary Association meeting at Columbus, Feb. 13 and 14., opposed the existing system, and advocated the Waring patent, as built at Memphis. He based his argument mainly on reported difference of cost, $4.25 per foot as opposed to 77 cents per foot as estimated by Col. Waring for Canton, O.

Railroads, and Canals.

THE number of men employed in building the Staten Island Rapid Transit Railroad was increased March 1, from 50 to 300. The contractor says the road will be built without delay.

IT is proposed to tunnel the Sierra on the line of the Central Pacific Railroad, from Truckee to Blue Cañon, and do away with the snow sheds, many of which are getting old and rotten, and break down easily under a heavy weight of snow.

CONCORDIA, KAN., March 27.—Work has been commenced on the Lawrenceburg and Belleville railroad by John Davidson the contractor. The distance is about fifteen miles. The work will be completed by June 1. It is a branch of Union Pacific road.

ST. CLOUD, March 28.—As soon as the frost is out of the ground the work of grading the new Southwestern line from this place will begin. The proposed line, 200 miles of which will be built this year, will be an important link in the Manitoba chain. The line is to be built toward Yankton.

E. C. DAVIS, of Crookston, Minn., has just returned from a prospecting trip over the proposed line of the Grand Forks, Crookston and Lake Superior Railroad. He reports a feasable route through a country abounding with material for ties and piles and forests of excellent pine. Secretary E. W. Walsh says the survey of the road will commence early in the spring.

WILKESBARRE, Penn., March 31.—Work upon the new branch railroad from Nanticoke to Morgantown, a distance of five miles, was entered upon Saturday by the Pennsylvania Railroad Company. A new coal town is to be opened at the latter place by the Susquehanna Coal Company, which will at once erect, breakers, shafts, and houses, and expect to ship coal at an early date.

PITTSBURG, Penn., March 29.—In the United States Court here to-day, D. W. C. Carroll, of Pittsburg, was appointed Receiver of the Newcastle and Northern Railroad upon application of Thomas P. Simpson, a New York contractor. An injunction was also issued against the company and all persons connected with it, restraining them from interfering with the Receiver's taking possession and managing the road.

NEARLY 10,000 men are now at work on the line of the Canadian Pacific around the north shore of Lake Superior. Work on this section has been prosecuted all winter. Work has also been resumed again on the western extension, which is now completed to the summit of the Rocky Mountains, 962 miles west from Winnipe , or 1,400 miles west from Lake Superior. Only 290 miles remain yet to be completed between the summit of the Rocky Mountains and the Pacific coast.

INDIA is filled with the railroad building mania, but it is an anti-monopolistic one. The wish is for the Government to reserve all the paying lines for itself, and to require all private enterprises, taking the others, to yield to the Government the "absolute right to fix rates and fares, and from time to time alter the same." The Bombay Chamber of Commerce has appealed to the Government to build from 2,000 to 3,000 miles of railroad each year for the next ten years and estimates the expense at $100,000,000 a year involving an addition of debt in the next ten years of $1,000,000,000, or nearly one half the debt of the United States at its highest point.

WHEELING, West Va., March 27.—A meeting of the stockholders of the Pittsburg, Wheeling and Kentucky Railroad Company was held this afternoon, to hear the report of the President for the past year. The gross earnings for 1883 were $124,511.41; operating expenses, $87,523.65; net earnings, $36,987.76; less hire of equipments, $2,956.69; net profit for the year, $27,031.07. The number of tons of freight carried was 165,812; increase over 1882, 26,351; number of passengers carried, 136,822; increase over 1882, 12,305; increase of earnings from all sources over 1882, $13,354.53, or 12 1-100 per cent. increase; in operating expenses, $3,754.39, or 12 64-100 per cent. increase; in net profits, $2,940.52, or 12 20-100 per cent. The old Board of Directors were re-elected, and the board at a subsequent meeting continued its present officers.

INVESTIGATING A RAILROAD.—Two or three years ago, while the Wisconsin Legislature was in session, a member gave notice that he would introduce a bill to investigate the affairs of a certain railroad corporation. Two or three days after this he was hunted up by an officer of the road, who said:

"I see that you intend to investigate our road?"

"Yes sir."

"Ah! yes; in which direction may I ask, will your investigation lead?"

"Why, I want to see if there is any way I can get the road to pass my old woman down and back from Oshkosh!"

There probably was. At least, the bill was never heard of farther.—*Wall Street News.*

DENVER, COL., April 1.—The action of President Lovejoy, of the Denver & Rio Grande Railway, in summarily dismissing General Manager D. C. Dodge, Chief Engineer J. A. McMurtrie, and Superintendent of Telegraph P. F. Woodward has created a sensation here. Public opinion is divided as to the justice of the action. General Superintendent R. E. Ricker assumes the duties of General Manager, General Freight Agent A. S. Hughes has been made General Traffic Manager, and R. A. Huchinson Superintendent of Telegraph. In an interview President Lovejoy said: "Mr. Dodge's dismissal was determined upon in New York. I anticipated that he might question my authority. The Board of Directors passed a resolution authorizing me to dismiss him."

HOW STOCKS HAVE FALLEN.—The following statement has been made up, showing the total mileage of railroads in the United States and the capitalizations. The depreciation in stocks for which a quotation can be obtained, from the highest in 1882 to the highest in March, 1884, is the enormous sum of $1,185,520,181:

Total mileage in United States	116,613
Other tracks, etc	26,890
Total	143,503
Common stock	$3,152,744,295
Preferred stock	467,769,496
Bonded debt	3,699,895,670
Total capitalization	$7,320,439,561
Highest cash value of quotable stocks since July 1, 1884	$5,664,471,755
Market value of same stocks, March, 1881	4,478,951,574
Depreciation	$1,185,520,181

NASHVILLE, Tenn., April 2.—The railroad between McMinnville and Sparta will be completed, in a few days, within six miles of Sparta. The owners are constructing another road from Dickson to Centreville. The roadbed is already completed to Edna Furnace, beyond Centreville. This road, when completed, will open up one of the most fertile fields. There is a movement on foot to erect a large iron furnace at Edna. Among the capitalists concerned are the following well-known gentlemen in Nashville: J. P. Drouillard, Col. Gaines, G. M. Fogg, and Col. J. B. Kilebrew, and Col. V. K. Stevenson, of New York. It is authentically stated that this furnace will be built this summer. There is a movement on foot for erecting a mammoth iron furnace at Centreville. Gentlemen interested in the Bonair coal-fields, six miles from Sparta, are in consultation with the Nashville Châttanooga, & St. Louis Railway looking to a proposition for the construction of a road from the mines to connect with the McMinnville and Sparta branch at Sparta. The mines are owned by ex-Gov. John C. Brow, J. F. House, W. C. Whetthorn, J. D. C. Adkins, Benton C. Millin, and G. G. Dibbrell.

BOSTON, March, 31.—Messrs. Latcha & Caten, railroad experts employed by the bondholders' committee, have made a careful examination of the Toledo, Cincinnati and St. Louis Railroad system, and, on the basis of their investigations, the committee state: "It is doubtful from the reports on hand if there was ever a month since the first incorporation of the road from Toledo that anything above the common expenses was earned. The great fault of the system is its narrow gauge, and, after a careful investigation by competent experts, the committee are of the unanimous opinion that inasmuch as it is scarcely possible to hope for success under a Receiver while the road is in an unfinished condition, and we shall soon be forced to foreclose the bond mortgages, all future efforts should be in the direction of a standard gauge from Toledo to St. Louis, which will enable us to exchange business with numerous crossing roads, and to compete or pool with others upon a safe basis at our terminus, and at the same time make our local business more secure. The estimated cost of bringing the road from Toledo to St. Louis up to a proper standard of narrow gauge is, by Mr. Latcha, $2,407,324; by Mr. Caten, $1,518,801; and for the same at standard gauge, by Mr. Latcha, $3,582,160; by Mr. Caten, $2,886,571. In addition to this, $2,163,000 would be required for terminals and equipment on a standard gauge basis."

THE Mexican Central Railroad tracks extend a total distance of 1214 miles, and connect the capital of the Republic with the eight largest state capitals, which are Aguascalientes, Chihuahua, Durango, Guanajuato, Guadalajara, Queretaro, San Luis Potosi and Zacatecas, the whole number representing 609,000 inhabitants. They also pass through twenty-five other principal cities and towns, with an aggregate population of 466,000. The total population of the states through which the lines pass is 5,674,000. The agricultural products of these states, exclusive of cattle, in 1879, were in weight 3,843,000 tons and in value $89,101,000; the average annual amount of gold and silver coined for five years at the seven mints situated upon the lines was $19,132,000. The subsidy granted the Mexican Central is $15,200 per mile, and the total amount of the subventions will be about $30,000,000. The gross earnings from commercial business alone on average mileage of about 525 miles for the twelve months ending December, 1883, averaged $157,000 per month.

WORK on the Vanderbilt South Pennsylvania Railroad, from Harrisburg to Pittsburg, is going ahead rapidly. About 2500 are employed on the line, mainly at the great tunnels. It is said the road may be completed in two years, but railroad men will not be disappointed if it will be three years before trains are running over it. Contractor Smith has made gratifying progress in the preliminary work on Harrisburg bridge. During the winter he has been quarrying and preparing stone for the piers and as soon as the water recedes sufficiently the work of building the piers will begin. It has been determined to begin work in the centre and work toward the shore each way. This is in order to have the warm weather and low water for the work at the deepest point. Mr. Shanahan has about 400 men at work on the Ray's Hill tunnel. He is penetrating from both ends and works day and night in the shifts. He makes 400 feet a month. Charles McFadden has the same force on the Allegheny Mountain tunnel, and by a similar system makes equal progress. This rate will complete both tunnels in about eighteen months.

Thomas Collins has the contract for the line from the Western portal of the Allegheny Mountain tunnel till within three miles of Somerset, a distance of ten miles. He has a large force at work, and is pushing it with his usual energy. The portion of the road lying

between the Western portal of the Ray's Hill tunnel and the borough of Everett will be put under contract in a few days. Over in Westmoreland County, a force of 200 men are hammering away at Knupp's tunnel, which will be the connecting link between that county and Somerset when the road is complete. Patterson & Kuhn are the contractors for Knupp's tunnel, and their contract includes a mile at each end of the long hole. Page & Co., an Ohio firm, have the next section of about eight miles, but they will sublet the greater part of it.

In the horse-shoe bend, between Laurel Hill and Chestnut Ridge, the new road will have a more extended and symmetrical one than the famous Allegheny Mountain horse-shoe bend of the Pennsylvania Railroad. The Chestnut Ridge horse-shoe bend sweeps Northward for more than a mile from the Felgar road into Cook Township, and by the most graceful and perfect curves returns to a point on the Beistle farm, making the distance between the termini of the horse-shoe but a few hundred feet.

The company has employed the Title Insurance Company of Pittsburg to examine the titles for about 250 pieces of land purchased by the company in Westmoreland County, The company will send two men to Greenburg next week to begin the work, which will take almost a year to complete.

Gas and Electricity.

THE electric light is now used in four churches in Montreal.

MUSCATINE, Iowa, will soon be lighted by electricity.

ASBURY PARK, N. J., has authorized Fletcher, Hedges & Fletcher, of New York, to lay gas-mains.

FIVE electric lights have been placed on the north of the top of the Washington Monument and five on the east. They are being placed in position, and will be lighted in a day or two.

THE Brush Electric Company are also erecting a large pole on the northwest tower of the Smithsonian for the purpose of displaying their lights.

ELECTRIC lights have been introduced into a gunpowder manufactory in England. The buildings are scattered over three miles of territory, and the wires are carried above ground from a dynamo near the centre of the enclosure.

THE Staten Island Gas Company, a new corporation, recently applied for the right to lay pipes and furnish gas in the villages of Edgewater and New Brighton. The Richmond County Gas Company, which has a monopoly in that territory, immediately reduced its rate from $3 to $2.25 per thousand feet. March 31st., the Edgewater Trustees gave the new company the rights asked for.

THEY got mad at each other on the way home from school, and as one of them turned in at Winder street she called out:

"Humph! Who cares for you! We are going to have the electric light in our house."

"You dasn't!"

"Why?"

"'Cause it would show the pimples on your mother's face!"

Contracting Miscellany.

NEW county buildings will be erected in Sauk Rapids, Minnesota.

ROANOKE CITY., Va., is organizing to secure the building there of a cotton mill, to cost $300,000.

THE City Civil Engineer of Cleveland, will advertise for proposals for cleaning the streets of that city.

BENJAMIN THOMPSON, County Surveyor, of Urbana, Ohio, on the 27th ult., sold Dugan Ditch, 4.6 miles long to Jeremiah Arn, for $3,248.95.

H. E. LELAND, of Brainerd, Minn., has taken a contract to furnish piling and timber to the amount of about one million feet for the Government dam on Pine River.

THERE is prospect of a delay in the completion of the Northern Pacific Bridge over the Rum River at Anoka, Minn., the iron for that structure having been shipped by mistake to the south.

FORT COLLINS, COLO., March 29.—About 800 feet of the tunnel of the High Line ditch is complete and there is about 600 more to be completed when the ditch will be ready for water. The contractors expect to have it completed in time for the irrigating season. The work has been through the side of a mountain of solid rock, and when the tunnel is completed it will bring a large area of land under cultivation around Fort Collins.

FORT WAYNE, Ind., March 28.—The contract for the completion of the Masonic Temple and Opera-house was awarded to-day to Christian Boseker, of Fort Wayne, for $26,000.

CARROLLTON, Ky., March 27.—The Commissioners have awarded the contract to build a new Court-house to W. W. McCoy, of Marietta, Ohio, whose bid was $16,437. Work to begin at once.

AN ocean pier, to cost $60,000, is to be built at Cape May this Spring. It is to be 1,000 feet long and 50 feet wide. A steamer is to run from this city every other day during the season.

THE Centrifugal Motor Company of Richmond, Va., organized to manufacture Farmer's Motor, an invention for operating machinery, was incorporated recently. Capital stock, $25,000,000. Directors, John M. Farmer, John S. Estes, John H. Estes and Wm. H. Stanley.

THE plans for the new State Insane Asylums, to be located at Richmond, Logansport and Evansville, Ind., are nearly completed. A cottage plan is designed for Richmond, and the asylum at Logansport will be the most imposing, as it will be built of stone, on a bluff overlooking the Wabash.

THE Cragdale Cotton and Woolen Manufacturing Company of Talladega, Ala., has been incorporated. Capital, $100,000. Dr. William Taylor, R. H. Isbell, J. H. Johnson, J. P. Wood, W. G. Sears, and W. H. Skaggs are the incorporators.

THE sum of $125,000 has been raised for a cotton mill in Knoxville, Tenn., a site purchased, and building will be commenced very soon. A large woolen mill in same city is also probable.

THE Standard Oil Company have commenced the construction of an office building at 24, 26 and 28 Broadway, N. Y. City, 87 feet wide, 9 stories high. Granite is to be used in the lower outer walls, and above the second story the material will be Wyoming Valley blue stone, and pressed brick.

FORT COLLINS, Colo., March 29.—About fifty additional men arrived from the East last night, and left for the stone quarries to work. This will increase the force to about 200 men, who are employed getting out stone, which is shipped thoughout the east and as far west as Oregon. The Fort Collins quarries are the largest in the west and have an unlimited capacity.

YOUNGSTOWN, March, 29.—Lon F. McAleer, a well-known railroad contractor here, was today awarded the contract for rebuilding the Pinkerton tunnel on the Baltimore & Ohio Railroad, ninety-two miles east of Pittsburg, for $1,250,000. The original tunnel was destroyed by fire seven years ago, compelling the company to build a line about it. The reconstructed tunnel will be 5,250 feet long, 33 feet wide and 22 feet high, built of arched masonry. The contract requires its completion ready for traffic on April 1, 1886.

DEFIANCE, O., March 28.—Business men of the city perfected an organization to be known as the Defiance Trade and Improvement Association for the purpose of advancing the interests of the town and courting new industries. Following are the officers: President, E. N. Lewis; Vice-Presidents, J. F. Deatrick, E. N. Lewis and A. Wilkem; Secretaries, F. G. Brown and F. J. Shead; Treasurer, B. L. Abell; Directors, C. A. Fliekinger, E. Squire, W. A. Kehnast, J. M. Preisdorfer and S. T. Sutpen.

ABSTRACT of proposals received and opened by direction of Lieutenant Colonel G. Weitzel, Corps of Engineers, 5th day of March, 1884, for dredging in the Delaware River at Smith's Island Bar, per cubic yard:

Frank Pidgeon, Jr., 33⅓c.
Frank C. Somers, 29½c.
National Dredging Company, 25c.
American Dredging Company, 24c.
Delaware and Chesapeake Improvement Company, 23½c.
Contract awarded to Delaware and Chesapeake Improvement Company.

THERE was a meeting of prominent citizens of the village of East Chester, N. Y., on Monday evening, at the residence of W. M. Giles, to consider a proposed roadway from that place to Bartow. The present road is three miles long, and it is very hilliy. By the new route, which is quite level, the distance will be only one mile. A resolution was adopted that a route more direct than the present one was desirable. It will be necessary to build a bridge over East Chester Creek. A committee was appointed to present the matter to the people of Pelham and to the Supervisors of the two towns. The estimated cost of the scheme is about $10,000.

A BUILDING boom has set in which far surpasses any previous activity of the kind at this time of year in St. Louis. More than 650 new houses have been started since the New Year and the applications for permits are rolling in at the City Hall. The architects report that they are crowded with orders and are preparing plans and estimates for a vast amount of new work. There is just one drawback to this pleasant outlook. Grave fears of troubles with their workingmen mar the hopes of the builders. They already report that there is a disposition to strike on the part of masons and carpenters, who are hinting at the necessity of a very considerable advanced in wages.

NEW YORK, March 28.—Mr. George S. Douglas, treasurer of the Iowa Barbed Wire Company, of this city, speaking to-day of the consolidation of all the companies manufacturing barbed wire, said: "The barbed wire is used only for fencing purposes. Its production in the year 1873 was about sixty tons, in 1883 it amounted to between 80,000 and 100,000 tons, and from present prospects the manufacture for this year will reach 150,000 tons. The demand for the wire is increasing more rapidly than the makers can supply it, and almost all the manufacturers are away behind their orders. The barbed wire fence has been adopted nearly all over the world. There is more than $5,000,000 invested in real estate and machinery for its production, and it requires a working capital of $15,000,000 per annum to carry on its manufacture. There are about fifty concerns and corporations engaged in making the barbed wire, the largest of which are in the states of Illinois, Missouri, Iowa and Pennsylvania, though there are many smaller manufactories scattered over the Eastern States. The wire which is now most generally used weighs about one pound to the rod."

PROPOSALS were opened by the Phila. Highway Committee of Councils on March, 31, for the construction of eighteen sewers, and of sixty-three bids made by twenty-three bidders, the following were the lowest: Enquirer Street above Brown, Thomas Murray, at $2.66 per foot; Sixteenth Street above Ridge Avenue. F. P. Murray, $2.30; Orthodox Street to Paul Street, W. H. Yoast, $2.94; Hancock Street, south of Norris, $2.43; Howard Street, above Girard Avenue, William H. Yoast, $2.51; Spring Garden Street, below Franklin, F. P. Murray, $2.50; Penn Street from Pine to South, J. B. Foster, $2.67; Master Street, above Seventh, F. P. Murray, $2.43; Forty-second Street, from Myrtle to Hutton, and Hutton West of Palm Street, John H. Noonan and William H. Yoast, each $2.45; Fiftieth Street, below Oregon, F. P. Murray, $2.72; Oxford Street, above Ridge Avenue, F. P. Murray, $2.00; Jefferson Street above Eighteenth F. P. Murray, 200; Seybert Street, from Twenty-second to Twenty-third Street, J. B. Foster, $2.19. For the sewers on Fairhill Street near Somerset, and on Venango Street, from Seventeenth to Twentieth Street, H. Dechan was the lowest bidder, at $1.97, but he claimed that his figures should have been $2.97 per foot. The Chief Commissioner declared that the bid of $1.97 appeared in the proposal, both in figures and in writing, and no change could be made by the committee. The following were the lowest bids for grading: On Willow Grove Avenue, from Germantown Avenue to Thirtieth Street, Twenty-second Ward, John Kerrigan, at nineteen cents per cubic yard; on Wellington Street, 490 feet Southeast of Kensington Avenue, J. Maier & Co., twenty-one cents per cubic yard; and Hull Street, from Amber to Adams Street, J. Maier & Co., twenty cents per cubic yard. For cleaning out the six-foot main sewer on Beaver Street, from Second to Canal Street, Andrew Toland's $348 was the lowest figure, as was the bid $2.50 per yard made by Owen McKenna & Co., for paving Nicholas Street from Twenty-fifth to Twenty-sixth street, with Belgian blocks.

Bridges.

LITTLETON, N. H., March 27.—Two dams and two bridges, at Franconia, were carried away to-day by the ice breaking up, and another bridge was seriously damaged.

THE Commissioners of Champaign Co., Ohio, will receive sealed proposals at Urbana, O., till noon of the 15th, for the construction of three highway bridges, two of 55 feet span, and one of 100 feet, 16 feet roadway, no sidewalks, bidders to furnish their own plans and specifications. Benjamin Thompson Secretary of the Ohio Society Engineers and Surveyors, is County Surveyor and Engineer.

THE Penn Bridge Works, of this place, have secured the contract for the bridge across the Beaver at Fallston. The structure will be of wrought iron, of the Whipple truss pattern, and will consist of two spans of 200 feet each, double roadway 20 feet wide in the clear, with one six-foot sidewalk. The contract calls for its completion by the first of June.—*Beaver Falls Tribune.*

The Northern Pacific road will soon let a contract for a bridge across the St. Louis River, connecting Duluth and Conners Point, to be complete in 120 days from the time of letting, or about September 10. The Omaha road will use the bridge to come into Duluth.

The Keystone Bridge Company, of Pittsburg, Pa., have secured a contract for building a bridge over the Ohio river, at Henderson, Ky., for the Louisville and Nashville Railroad Company. The channel span is to be 525 feet in length. Eight spans each are to be 250 feet long, and five spans each 120 feet in length, with trestle work approaching the channel span, which will take 3,800 tons of steel and iron. When completed, it will be 3,125 feet long, and will, it is said, be the longest straight truss span on the American continent.

At a meeting of the N. Y. Park Commissioners on the 2nd., A. P. Boller, George McNulty, and Joseph M. Wilson submitted plans for a bridge over the Harlem River at One Hundred and Eighty-first-street. Mr. Boller & Mr. Wilson provide for a Cantilever bridge, the former estimating the cost at $1,500,000. It would be 125 feet high at the central span and 100 feet wide. Mr. McNulty proposes a stone viaduct, handsome in design, and costing $3,064,624. It would be 80 feet wide, and the central arch would be 542 feet long. The central span of the bridge proposed by Mr. Wilson would be 101 feet above the water. It would be 450 feet long, and the width would be 80 feet. Its estimated cost is $1,193,347. No action was taken on the designs.

During the past year, references have been made to the new railroad bridge now building across the St. John River for the New Brunswick Railroad. The general plan of the bridge is like that recently erected on the Michigan Central Railroad over the Niagara River, except that the St. John bridge will be a through instead of a deck bridge, and will be the first through cantilever bridge ever erected. The main span will be 477 feet from the centre of the piers, the shore arms being 143 and 190 feet long respectively, making a total length of 810 feet from centre to centre of abutments. The girders are placed 20 feet apart on centres, and are 28 feet deep at the ends and centre and 65 and 80 feet deep over the piers. The track on the bridge will be supported by four lines of steel stringers, and three lines of lateral bracing will hold the bridge against wind pressure. The masonry of the main bridge will be completed in June, and the erection of the main bridge be begun about the first of July. It is expected that the whole line, including the river bridge, will be ready for the passage of trains from the Intercolonial to the New Brunswick Railway early in the fall.

Ottawa, Ont., March 31.—An act incorporating the Niagara Frontier Bridge Company, has passed through the Railway Committee and will come up again in Parliament on Wednesday for its third reading. The object of the bill is to enable the St. Catharines and Niagara Central Railway Company to bridge the Niagara River at Queenstown, over which trains may run to connect with the United States roads at Lewiston. The act gives the company power to construct, maintain, work and manage a bridge for railway and other purposes across the Niagara River, from some point in or near the village of Queenstown, in the county of Lincoln, Ontario, toward some convenient points in the State of New York, in the United States of America, at or near Lewiston. The company shall not commence the actual construction of the said bridge until an act of the Congress of the United States has been passed consenting to or approving of the bridging of the said river, or until the Executive of the United States has consented to the same. The capital stock of the company will be $500,000, divided into 10,000 shares of $50 each.

When the bridge is completed, the trains of all railroads terminating thereat, either in Canada or the United States, shall have the right to pass over the bridge at corresponding rates for the persons and property transported, and no discrimination in tariff rates for transportation shall be made in favor of or against any railroad whose trains shall pass over the bridge.

Mining.

A silver lode, yielding $40 to the ton, is said (March 30) to have been discovered at South Canaan, Wayne Co., Pa.

The Union Coal Co., W. L. Scott, of Erie, Pa., President, has leased two of the largest Shamokin collieries, owned by the Mineral R. R. Mining Co.; they began work April 1.

The new and rich tin mines in the Black Hills, are said to be owned by James Wilson of New York, the inventor of oleomargarine.

Prospective snow-slides are an important factor now in the selection of sites for mills and mining buildings, several having been carried away in the winter just past.

J. C. Goa, of Clarendon, Warren County, has been engaged to drill five holes into the burning mine in McDowell County, W. Va., where 153 miners perished. The distance to be drilled is 500 feet. All the tools and supplies will be shipped from Warren. The mine will be flooded.

Miners interested in leases of mines which contain galena ores will bear in mind that clean galena, free of pyrites and zinc, is not necessarily a refractory ore. Galena is smelted in Missouri, at a cost of about $5 per ton. Nor will our smelters charge $20 to $23 for the reduction of galena and carbonate mixed, unless the same is associated with the refractory elements of zinc, pyrites, etc. A good many interested holders in leases, well posted themselves, are frequently taking advantage of the innocence of their partners in this respect.

The Mexicans still stick to ancient methods in mining; they follow the vein closely up and down and zig-zag; use notched tree trunks for ladders, on which a Yaqui Indian will carry a weight of 416 pounds, held by a strap around his forehead, with a pole ladder 65 feet long, inclined at an angle of 25° from a vertical; he does not use his hands for a support. The miners are afraid of gunpowder and rarely use it; picks and small spades fill all needs. The miners' pay ranges at ten, thirty and forty cents per day, and of this they expend six or seven cents a day for subsistence, and use up the remainder in a periodical spree.

Since the January estimates particulars of lead production have been received from all quarters, and from these it appears that the aggregate European output in 1883, was 336,500 tons of pig lead; our own 130,000, and in other countries 3,500; together 470,000 tons of 2,240 pounds, against 440,000 tons in 1881, an increase in two years of about 7 per cent. During the past fourteen years Spain alone has exported about 4½ per cent. more lead than our entire output during the same period; but the latter has increased much faster than the peninsula, and we have now overtaken that country.

Colorado furnished, last year, about 60 per cent. of our entire pig lead output.

The price of lead since Jan. 1. 1884. has been fluctuating between 4 and 4½ cents, but now develops greater strength.—*Leadville Chronicle.*

The advantages which a careful examination of all curious or unknown mineral specimens, are likely to bring to the finders, is admirably illustrated by a recent discovery told of by the New York *Times.* A geologist who was studying the anthracite region of Pennsylvania a few weeks ago, had his attention called to a piece of green crystal, found by a farmer named Samuel Herb, on his farm. A brief inspection showed that the mineral was sapphire corundum a mineral in great demand, and worth in its crude state about $200 a ton. Further search showed the existence of a vein 38 inches wide, and as there are but few mines of the kind in the world, the value of the land has risen tremendously. A week before the discovery the tract, which is barren and sterile, was offered for sale for $300, but a Boston company, after some exploration, recently paid $50,000 for it. One large green crystal, found in the soil near the mine, of remarkable transparency, has been cut into a gem of considerable value.

St. Paul, Minn., March 29.—State Senator Griggs has just returned from the Cœur d'Alene region and says that the yield of gold, the coming season, will be extraordinary. One miner, a few weeks ago, who was too poor to buy his own outfit, has taken out $5,000 worth from a placer six feet square. Another has sold quarter of his claim of five acres for $10,000 cash. A miner at Rathdrum has sent $1,200 in gold to the United States Mint. He showed me three nuggets worth $167. The merchants at Spokane Falls have taken in $40,000 from the miners in exchange for supplies. A few of the placers are working, but on most of them there is from two to twenty feet of snow. The snow, however, is melting rapidly, and the miners who are working take out $40 a day per man. The men who jumped the "Widow's Claim" last fall, while fighting the matter in the courts, have taken out $18,000. There are 5,000 men in the mines, and their claims cannot be bought. Many sit with gun in hand watching their claims. People are flocking into the mining region at the rate of 100 a day. At Thompson's Falls over 100 buildings have been erected in the last two weeks. I anticipate an influx of from 50,000 to 100,000 people.

John C. Landreau, writing from Santiago de Cuba, says he has seen veins of iron, within ¼ mile of a good harbor, running from 30 to 150 ft. in thickness and of immense area. In one location the superficial area of such a deposit, was measured and found to contain 1,837,450,000 cubic yards of ore, on 3 square miles. A company from Bethlehem, Pa., is at work here, have bought several mines, and will have a railroad built by June 1.

IRON, METAL AND COAL MARKETS.

Philadelphia, April 4, 1884.

The Iron Market remains in a very dull and unsatisfactory condition. Demand is, in the main, for current requirement only, and prices are weak and fluctuating. Prices of Steel Rails have declined, as it was predicted they would, to $33.50c.@$34, and even at these low prices only small lots, of 500 to 1000 tons each, are being placed. There has been a moderate amount of activity in Foreign, but Foundry is very quiet. Manufactured Iron shows no improvement either in demand or prices, both being unfavorably affected by the competition of Western Irons which are being offered here. Pig Iron is similarly affected by Southern irons, which continue to be offered here at very low prices. Very little is doing in Foreign Irons, Arrivals of Scotch are light. Bessemer is marked at $20, $20.50c.@$21 asked. Nails are in improving demand. Plate, Tank and Structural Irons are moving in small lots. Two Railroad companies are daily expected to place orders for 8 to 10 thousand tons of Bridge Iron. Old Rails are wanted in large lots, but sales have been trifling owing to a difference of about 25c.@50c. per ton between buyers and sellers. Merchant Iron sells at $1.90@$2 for refined. Plate Iron, $2.50 for common. Nails, $2.20@$2.60, with improving demand. Large quantities of Nails and Structural and Plate Iron will probably be ordered during this month.

Pittsburgh, April 4, 1884.

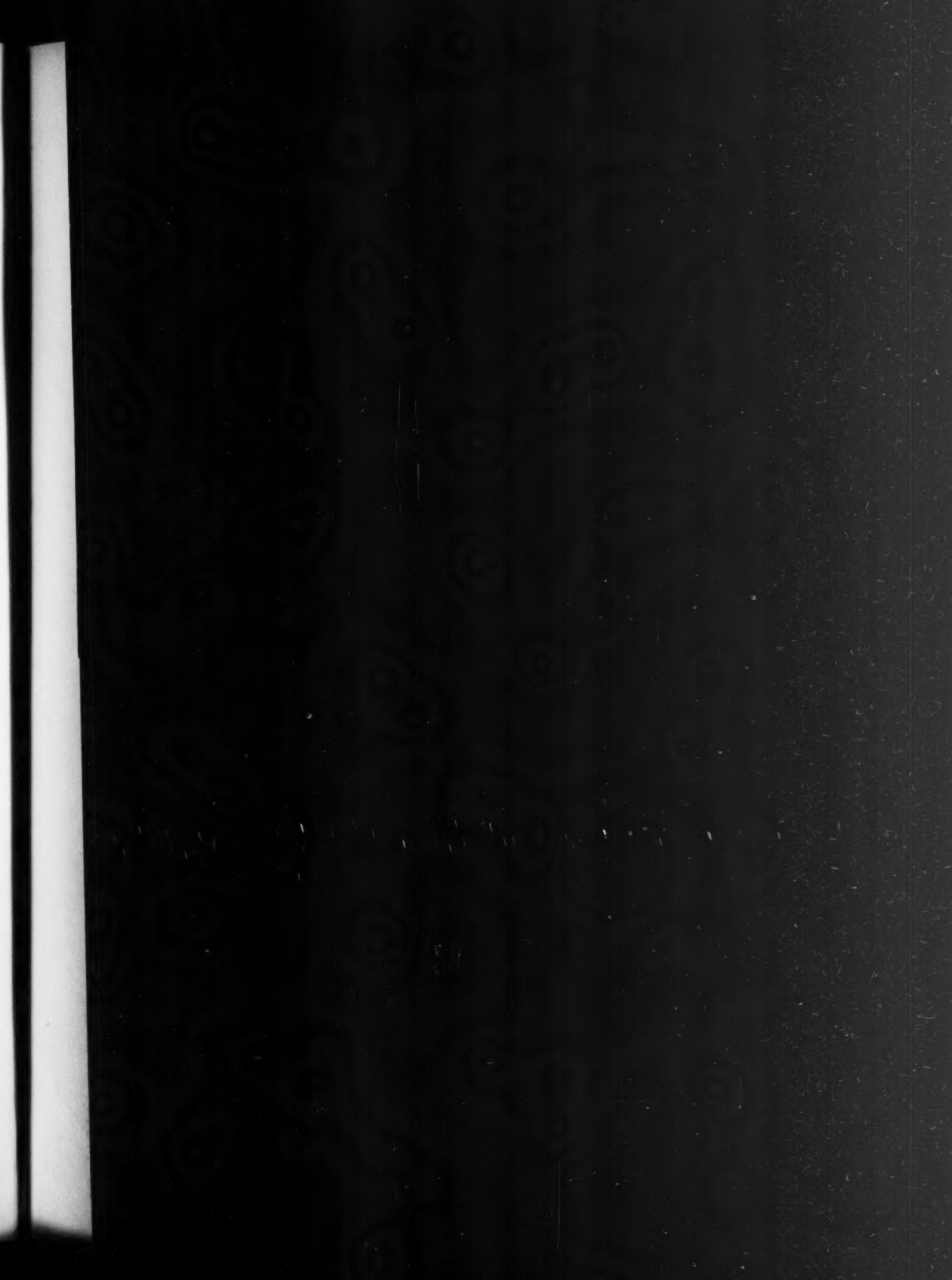
Considerable improvement is to be noticed in several branches of the Iron trade. Heavy requirements are not being provided for, but consumers, feeling that an improvement is at hand, are ordering more fully for current needs. Nails, Plate, Tank, Sheet Iron, and Merchant Steel, are all in improving request; mills are increasing their output, and several are making improvements. One mill is going to add largely to its capacity for turning out Structural and Building Iron. Steel Rails are very dull, with no prospect of an improvement in demand. Quotations are, for Mill Irons $17@$18; Charcoal Foundry, $23@$25; No. 1 Foundry, $20@$21; Muck Bar, $32@$33; Nails, $2.35@$2.45; Old Rails, $23@$24; Steel Rails, $35@$36 asked at mill. Merchant Bar Iron, $1.70@$1.90. The Keystone Mill has resumed operations, single time, and will probably start up double time next week. The Glass trade lacks the expected activity. Strong competition has been developed, and the prospect of declining prices are delaying the placing of heavy orders.

Chicago, April 4, 1884.

The old story of dull demand, and weak prices, with prospect of an early improvement, has to be repeated this week. There is a generally improving tone in the market, principally because of the belief that orders cannot be withheld much longer. There is a very moderate movement in Bar Iron, at $1.91 for common, and $2 for refined, with concessions for large lots. Best Steel is moving fairly, and at firm prices, but prices are cut on low grades, and demand is very sluggish. Nails are quite strong at $2.60@2.65, with very little shading. Demand is not active, and the strength, such as it is, results from the scarcity caused by the floods. Lake Superior Charcoal Irons are active, and a slight advance is probable, as several furnaces making this Iron are going out of blast and stocks are light. The Ore market is quiet but prices are strong and shady. Railroad Supplies and Heavy Hardware are dull. Shelf and Builder's Goods are active for the season. Tools, Farm and Garden Implements are moving freely. It is probable that a week or two of good weather will bring out buyers of all kinds of material, but at present orders are placed with extreme caution.

COAL.

Philadelphia, April 4, 1884.

Full time production was commenced on the first of the month, and will be continued as long as the markets will bear it. Consumers think that prices will certainly decline under full time, and large orders are withheld; but the companies are confident that, with their expanding markets, they can market all they produce, and maintain prices. Extensive preparations have been made for producing large quantities of Coal, and handling cheaply and expeditiously; Chicago alone will probably take 2,000,000 tons this year. The New England Market for Anthracite will be considerably interferred with by Bituminous, but Western and Southern demand will more than atone for the loss of these markets.

The Bituminous trade is dull, and orders are being placed rather slowly, prices are unprecedentedly low, and still have a downward tendency.